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NOTES ON NEW ENGLAND VIOLETS,—II.

Ezra Brainerd.

It would seem that after careful scrutiny of their claims two boreal species must be added to the list of New England violets. One is *Viola Novae-Angliae*, published by Mr. House in a recent number of Rhodora.[1] It is surely a good species, and was believed to be so by others before Mr. House pointed out its claims to recognition. Mr. Fernald, who collected the type specimens, wrote on sending duplicates to me with other material last February: "One, Mr. Pollard has called *V. emarginata*, but I can't believe that the little plant of Fort Kent and St. Francis (my nos. 2244, 2245) has much to do with the southern species. I have always been confident from the habitat of the plant and the high-northern species with which it grows, that it represented a thoroughly distinct species. I shall endeavor to get more and better material this year. I shall be glad to have you describe the plant, if you, too, feel that it is quite distinct."

Though recognizing its distinctness, I deemed it prudent to wait for summer specimens showing the mature leaves and fruit. During my brief study of the genus I had become painfully aware of the confusion that had arisen from the publication of scores of obscure and illegitimate species, based on scanty or immature material; and I felt that no one ought to create a species in this group before seeing the plant in its mature stages of growth. Accordingly Mr. Fernald went to the trouble and expense of a journey to St. Francis last July, secured midsummer specimens, and had the live plant reproduced in a water-color that beautifully exhibits the capsules of both petaliferous and cleistogamous flowers.

Meanwhile Mr. House, in entire ignorance of this investigation,

[1] Rhodora, vi. 226, pl. 59 (1904).

has described and figured the species from flowering specimens formerly sent to Mr. Pollard. Under the circumstances I am sure there will be no discourtesy, if from the new material in my possession I supplement his description, and point out some of the errors into which he has fallen from not knowing the mature fruit of this and of some of the other specimens cited.

With these data in hand it is not "difficult to decide the systematic position of this species." It is a very close ally of *V. septentrionalis.* In fact, I find only two evident characters by which it can be distinguished from that species,— the narrowness of the leaf and the absence of ciliation in the sepals. The two species are alike in pubescence, in the color of the petals, in the bearded spurred petal, in having sagittate cleistogamous flowers on short declined peduncles, and in the size, color and shape of the capsules. In midsummer the leaf and the capsule of *V. Novae-Angliae* naturally attain to a greater development than is indicated in Mr. House's dimensions, and the leaf loses the thinness of texture of which he speaks.

In addition to the type specimens from Fort Kent, Mr. House has cited as referable to this species specimens from four other stations. The St. Francis plant is unquestionably the same, growing along the same river fifteen miles farther up. But the plant from Orono, Maine (no. 2256 Fernald) is surely to be otherwise disposed of; as Mr. House would have doubtless himself admitted, had he seen the plants collected from the same station the following September. Oddly enough, this is one of the plants cited by me in RHODORA (vi. 216) as *V. septentrionalis* × *fimbriatula*, growing with the parent forms. Not only are the leaves of this much wider than in *V. Novae-Angliae* and the sepals ciliate; but also some of the cleistogamous capsules are quite green as in *V. fimbriatula*, and all more or less sterile. In fact, the Orono specimens are quite like Mr. Mathews's excellent drawing of this hybrid.[1] (RHODORA, Plate 58, fig. a.)

[1] The above comment was based upon specimens of Mr. Fernald's no. 2256 in the Gray Herbarium. Since, I have been able through the courtesy of Dr. Rose to examine the sheet of this seen by Mr. House in the National Herbarium. It is interesting to note that two of the four plants there shown are the above named hybrid; but closely intermingled with them are two plants of *V. septentrionalis*, one of the parent forms. It may be readily distinguished from the hybrid by the broader leaf, scantier pubescence, and the notably less conspicuous stipules.

The plant from Bridgeport, Connecticut, is also in my judgment incorrectly referred to *V. Novae-Angliae.* The fact that the two stations are at the opposite ends of New England, 500 miles apart, is suspicious. But the leaves of Dr. Eames's plant are much wider and less cordate at the base than Mr. Fernald's; the sepals are narrowly lanceolate, some of them ciliate and with long hispidulous auricles, betraying, to my mind, traits inherited both from *V. cucullata* and from *V. fimbriatula.* In short, the plant is the same, so far as the characters are developed in the vernal stage, as those that I have regarded (RHODORA, vi. 217, 218) as resulting from a cross between these two species. The hybrid proves to be not uncommon in southern Connecticut, as I have received it recently from three stations other than those cited in RHODORA.

The remaining plant referred to *V. Novae-Angliae* by Mr. House was collected by Mr. Pollard on the Blue Hill Reservation near Boston. In leaf-outline these specimens have a closer resemblance to the Fort Kent plant than have those from either Bridgeport or Orono; but in fact they are only small seedlings of *V. fimbriatula.* Two of these young plants at the date of collection, Aug. 24, had already produced cleistogamous flowers, but the two green capsules shown are borne on erect peduncles 6–7 cm. long, not on "short horizontal" ones, "1.5–2.5 cm. long," as in *V. Novae-Angliae.* The slender sepals, the long somewhat hispidulous auricles, the denser pubescence, the relatively shorter leaf-blades, the more obscure crenation, all point to *V. fimbriatula.*

The new species, then, seems to be known only from the two stations along the River St. John, on the northern boundary of Maine. Judging from its associations and its affinity to *V. septentrionalis*, it is more likely to be found hereafter northward or eastward, in Quebec or in New Brunswick, than southward in New England as a whole. The name *V. Novae-Angliae,* consequently, turns out to be somewhat unfortunate.

The other new species of Viola for northern New England is more widely distributed. It has been found at four stations in Maine and four in Vermont,— in mossy bogs, along streams in silt or gravel, or in the wet debris of cliffs. It is ordinarily a small plant, in its vernal state not easily distinguished from *V. affinis*; but later it develops leaves that are broader than in that species, less conspicuously crenate, and cleistogamous fruit that is green instead of purple. In

these respects it approaches *V. cucullata*,— so much so that on my first acquaintance with the plant in August, 1903, I queried if it might not be a hybrid between this and *V. affinis* which were growing with it. However, the violet color of the petals, the obtuse sepals, the constant green of the capsules and the absence of all indications of sterility convinced me during the past season that the plant was a valid species, answering well to the description of *V. vagula*, Greene (Pitt. iv. 67). As no type of this species was extant, one of the chief objects of a visit to Ottawa last September was to observe this plant in the original station. Under the courteous guidance of Dr. James Fletcher this was accomplished. The station is a flat, boggy "beaver-meadow" across the Ottawa River in Hull, Quebec, and the plant has proved to be identical with those from Vermont and Maine.

But the species is found to extend across the Dominion of Canada from Eastern Quebec at least to the Rocky Mountains. Mr. Fernald collected it the past summer at seven stations along various rivers of the Gaspé Peninsula. Mr. A. B. Klugh has sent it to me from near Guelph in western Ontario. In the Gray Herbarium there are specimens from Saskatchewan and from Assiniboia; and in the National Herbarium a fine sheet from Banff, Alberta, showing the plant both in petaliferous flower and in its late summer stages with characteristic leaves and fruit. Furthermore, the species is found to extend southward in the Rocky Mountain region at least into Colorado. The large herbaria at Washington, New York and Cambridge show that the plant is common in all the mountainous States of the northwest, the specimens collected of late years passing usually under the name of *V. cognata*, Greene, or *V. nephrophylla*, Greene.

Through the great kindness of Professor Greene the type specimens of these two species have been sent me for study. They were collected by Professor Greene himself in the summer of 1896, — *V. nephrophylla* at Cimarron River in western Colorado, and *V. cognata* at Dale Creek, about 200 miles to the northeast, on the southern borders of Wyoming. The latter was in the advanced stages of petaliferous flowering, the thirteen plants preserved showing eight cleistogamous ovoid flowers on slender ascending or horizontal peduncles 2–4 cm. long. The petals are all more or less hairy; the sepals ovate or oblong, obtuse; the later leaves, cordate, obtuse, obscurely crenate, glabrous. In all these characters the plants closely resemble the eastern specimens collected at that stage of growth.

The type of *V. nephrophylla* consists of fourteen plants collected two months later, August 29. They display numerous cleistogamous capsules in various stages of growth, the mature ones being oblong, green, 6–8 mm. long, bearing oblong obtuse sepals half the length of the capsule. Several of the plants also bear on peduncles (2–4 cm. long) reduced petaliferous flowers, which cannot be regarded as a remnant of the vernal crop, but as an occasional autumnal development, not rarely observed in other species of violets. Indeed, Dr. Fletcher and myself found two such flowers with half-developed petals at the type station of *V. vagula*, September 3d. The leaves of *V. nephrophylla* are broadly cordate, obtuse or with a short blunt apex, obscurely crenate, glabrous (save a few minute stiff hairs on the upper surface of some of the basal lobes), 2–5 cm. wide, except that in one large plant the width of 6.8 cm. is attained. In all these particulars the eastern plants under discussion in their autumnal stage are an excellent match for *V. nephrophylla.* In spite of a marked difference in aspect of these two western types, I am forced to regard them as representing only one species, collected first in its vernal state, and afterward in its late summer development.

It should not surprise us to find a northern species of Viola extending through such a wide range of longitude. There are a hundred or more boreal species occurring in the northern Rocky Mountains, and also in northern New England or in eastern Canada; and fresh researches are yearly adding to the list.[1] Among these additions it is interesting to find this distinct violet, of which I venture to set forth the following description:

VIOLA NEPHROPHYLLA, Greene. Glabrous, but under a lense often disclosing minute stiff white hairs on the upper surface of æstival leaves, and occasionally on petioles and veins beneath; earliest leaves orbicular or slightly reniform, later leaves cordate-deltoid or broadly cordate, obtuse, obscurely crenate-serrate, 3–6 cm. wide; flowers violet, on peduncles exceeding the leaves, spurred petals

[1] As illustrating the points of identity in these two floras, I would cite on Mr. Fernald's authority: *Anemone parviflora*, *A. multifida*, *Thalictrum alpinum*, *Ranunculus Macounii*, *R. Purshii*, *Astragalus elegans*, *A. frigidus*, var. *Americanus*, *Dryas Drummondii*, *Parnassia parviflora*, *Epilobium latifolium*, *Lonicera involucrata*, as characteristic plants of the river-valleys where *V. nephrophylla* abounds in Eastern Quebec. In one section alone of Carex (Hyparrhenae) I count twenty-one species common to the two regions in which *V. nephrophylla* is found.

somewhat bearded, the lateral densely bearded, and often the two upper with scattered hairs; sepals ovate to lanceolate, obtuse or often rounded; cleistogamous flowers on short and recurved or prostrate peduncles, ovoid, producing green oblong capsules 5–8 mm. long.— Pitt. iii. 144; *V. cognata*, Greene, Pitt. iii. 145; *V. vagula*, Greene, Pitt. iv. 67. — The eastern stations from which the species has been seen are the following: Quebec; Hull, 1898, *J. M. Macoun*; Gaspé Co., banks and gravel beaches of Grand and Dartmouth Rivers; Bonaventure Co., along the Restigouche, Escuminac, Bonaventure and Little Cascapedia Rivers, June 28–Aug. 27, 1904. *M. L. Fernald.* Maine: Fort Fairfield, river-beach, June 5, 1901; Masardis, abundant on ledgy river-bank, Sept. 8, 1897; Blaine, arbor-vitae swamps, in sphagnum, June 23, 1898, no. 2255, and June 7, 1901; Winslow, rocky shore of Kennebec River, Sept. 2, no. 2626, & wet calcareous cliffs, Sept. 3, 1898, no. 2612, *M. L. Fernald.* Vermont: wet slides of Willoughby Mt., June 2, 1892, July 18, 1896, & May 26, 1901, *G. G. Kennedy*; May 27, 1903, *W. W. Eggleston*; Aug. 30, 1904, *Annie Lorenz*[1]; New Haven, shady border of bog, Aug. 14, 1903, & May 18, 1904; Middlebury, river-border under alders, 1904; Manchester, wet mossy meadow and in moist loam along a brook, Sept. 26, 1904, *Ezra Brainerd.* Ontario: Wellington Co., open springy ground near Puslinch Lake, May 15, & 17, 1904, *A. B. Klugh.*

There are indications that in southwestern New England we may have two more species, hitherto recorded only from the Middle States. Dr. E. H. Eames has collected in the vicinity of Bridgeport, Connecticut specimens that Mr. Pollard has pronounced to be *V. villosa*, Walt; and Profr. Greene asserts (Pitt. iii. 313) that *V. emarginata* "is known to me as occurring as far northeastward as the vicinity of New York City." The latter species is, indeed, too vaguely apprehended. The specimens under covers so labeled are in many herbaria a medley of odd things, from such a plant as *V. Novae-Angliae* to others with broad deeply lobed leaves, as figured by Mr. W. Stone (Proc. Acad. Nat. Sci. Phila. 1903, Pl. 36. v.). But aside from these aberrant forms, that require prolonged and critical study of the living plant, it may be presumed that there is a "typical" *V. emarginata*, such as is figured in the Britton Illustrated Flora (iii. 520).

In view of these additions and the clearer knowledge that has come from another season's field work, I desire to present the following revised synopsis of our blue stemless non-stoloniferous

[1] These plants, through an error of mine, were called *V. venustula* in Dr. Kennedy's Flora of Willoughby (Rhodora, vi. 123).

violets. *V. pedata* is in a class by itself, having no bearded petals and no known cleistogamous flowers. The other species I would arrange according to their natural affinities as follows: —

Key to the Blue Acaulescent Violets of the Northeastern United States.

I. Peduncles of cleistogamous flowers decumbent or declining.
  A. Cleistogamous flowers ovoid or ovoid-acuminate; auricles of sepals short, appressed.
    a. Leaves cordate, glabrous, 2–6 cm. wide; petals violet, spurred petal somewhat bearded; cleistogamous capsules usually growing above ground, subglobose or oblong, 5–8 mm. long; sepals half the length of capsule.
      * Aestival leaves not acuminate, obscurely crenate; cleistogamous capsules green, bearing broadly ovate to lanceolate usually obtuse often rounded sepals. (1) V. NEPHROPHYLLA, Greene.
      * * Aestival leaves acuminate, conspicuously crenate-serrate; cleistogamous capsules purple, bearing lanceolate attenuate sepals. (2) V. AFFINIS, LeConte.
    b. Leaves broadly cordate, or lobed in (6), 4–12 cm. wide; spurred petal almost or quite beardless except in (3); cleistogamous capsules often underground until mature, oblong, 8–15 mm. long; sepals ovate-lanceolate, one-quarter to one-third the length of capsule.
      * Plants nearly or quite glabrous; petals violet; cleistogamous capsules usually pale green.
        † Vernal leaves purple beneath; aestival leaves often broadly deltoid or with concave edges toward the apex. (3) V. LATIUSCULA, Greene.
        † † Vernal leaves green beneath; aestival leaves rounded above the base or the apex but slightly produced. (4) V. PAPILIONACEA, Pursh.
      * * Plants more or less villous-pubescent; petals commonly light blue or lavender; cleistogamous capsules usually purple.
        † Leaves never lobed. (5) V. SORORIA, Willd.
        † † Leaves more or less lobed. (6) V. PALMATA, L.
      * * * Upper surface of leaves hispid-pubescent; petals reddish purple. (7) V. VILLOSA, Walter.
  B. Cleistogamous flowers sagittate, producing short-obovate or subglobose usually purple capsules 4–7 mm. long; auricles in fruit long, spreading; petioles veins and margins of leaves hirsutulous; petals violet, spurred petal bearded.
    a. Leaves cordate, 4–7 cm. wide; sepals and their auricles ciliolate. (8) V. SEPTENTRIONALIS, Greene.
    b. Leaves narrowly cordate-deltoid, 2–3.5 cm. wide; sepals and auricles not ciliolate. (9) V. NOVAE-ANGLIAE, House.

II. Peduncles of cleistogamous flowers erect; their capsules oblong, green, bearing lanceolate to narrowly lanceolate long-auricled sepals.
  A. Spurred petal bearded; cleistogamous flowers sagittate.
    a. Leaves pubescent, ovate-oblong, often coarsely toothed at base; petals purple. (10) V. FIMBRIATULA, J. E. Sm.
    b. Leaves nearly glabrous, lanceolate, basal lobes prominently toothed or incised; petals purple or violet. (11) V. SAGITTATA, Ait.
    c. Leaves nearly glabrous, deltoid, basal lobes finely toothed or incised; petals blue. (12) V. EMARGINATA, LeConte.
    d. Leaves nearly glabrous, deeply lobed or parted.

* Leaves truncate at base or subcordate, slightly decurrent, middle lobe usually the widest, segments 7–9; petals violet.

(13) V. septemloba, LeConte.

* * Leaves decurrent on petiole, flabellately veined at base, segments of nearly equal width, 9–15; petals blue.

(14) V. pedatifida, Don.

B. Spurred petal beardless; cleistogamous flowers subulate; leaves cordate, glabrous; petals pale blue, darker towards the throat.

(15) V. cucullata, Ait.

Middlebury College.

A PECULIAR VARIETY OF DROSERA ROTUNDIFOLIA.

M. L. Fernald.

In August, 1904, the marly sphagnous bogs at the mouth of the Grand River, Gaspé County, Quebec, were found by Messrs. J. F. Collins, A. S. Pease, and the writer to be the home of many remarkable plants, among others three Droseras which are little known to American botanists. One of the bogs had its open marly spots almost given over to four plants, *Drosera linearis*, Goldie, *D. longifolia*, L. (*D. anglica*, Hudson), *Juncus stygius*, var. *americanus*, Buchenau, and *Pinguicula vulgaris*, L., though other species, there less abundant, were quite at home in the calcic carbonate.[1] On the mossy knolls at the borders of the open marl normal *Drosera rotundifolia* was abundant.

Soon after the exploration of this bog, another, perhaps a mile distant, was visited. On entering the bog a tiny inflorescence was noticed, so strange in appearance that at first sight it was taken to be the unique *Saxifraga stellaris*, var. *comosa* of Mt. Katahdin. Instead, however, the plant proved to be a peculiar dwarf variety of *Drosera rotundifolia* with subcapitate inflorescences of few flowers, the petals colored, and the ovary instead of producing normal capsules, tending to develop into a rosette of glandular foliage-leaves. This tendency was also noted in other floral organs, but it was most apparent in the carpels.

Examination of the bog showed that the anomalous Drosera was abundant in the wet portion between the central pond and the higher

[1] An analysis of soil from a similar bog in Aroostook Co., Maine, shows it to contain nearly 96 % of calcic carbonate.

arbor-vitæ forest, occupying an area of perhaps a half acre. Occasional normal plants of *Drosera rotundifolia* were found but these were always taller and coarser and far less abundant than the plant with foliaceous carpels. That this little plant maintains its peculiar character was shown not only by its distribution throughout one end of the bog, but by the shrivelled remnants of similar inflorescences on scapes produced in past years.

Whether the plant reproduces itself by means of the peculiarly developed carpels cannot now be stated. Living material now being studied at the Ames Botanical Laboratory and forming the basis for Dr. Leavitt's notes on page 14 will doubtless demonstrate this point. The plants, however, are not without their own method of abundant reproduction, for many of the specimens showed, springing from the decaying leaf-blades or the injured petioles, young plants such as have been already described by various observers.[1]

The dwarf plant perpetuating itself and occupying a considerable area almost to the exclusion of normal *Drosera rotundifolia* may be called

Drosera rotundifolia, var. **comosa**. Dwarf, the scapes 2 to 8 cm. high: leaves comparatively small, the blades 3 to 7 mm. long: inflorescence 1- to few-flowered, subcapitate: calyx crimson or roseate: petals greenish to crimson, sometimes foliaceous: carpels in maturity developed into green glandular broadly obovate or oblate petioled leaves: other portions of the inflorescence occasionally modified. — Wet boggy margin of a marl-pond, near the mouth of Grand River, Gaspé County, Quebec, August 13, 1904 (*J. F. Collins, M. L. Fernald and A. S. Pease*). Type in Herb. Gray.

Gray Herbarium.

IDENTITY OF PRICKLY LETTUCE.

Lyster H. Dewey.

The earliest authentic records that we have of the presence of prickly lettuce in this country are three specimens collected in 1863 and 1864, in the vicinity of Cambridge, Massachusetts, and now in

[1] See Bull. Torr. Cl. xix. 295; Rhodora, i. 172, pl. 8; 206, pl. 10.

the Gray Herbarium of Harvard University. These were identified as *Lactuca scariola* L., and a description of the plant under this name appeared in the 5th edition of Gray's Manual, published in 1868. From 1880 to 1885 the plant was reported from several localities in Ohio, Indiana, Illinois and southern Michigan. It seems probable that there were several independent introductions of the seed mixed with poorly-cleaned field seeds. It became abundant in the regions where clover seed and grass seed are largely produced, and then its distribution rapidly increased. Within 30 years from the date of its first recorded appearance in this country it had reached every state and territory in the land, and in many localities it quickly came to be recognized as the most prolific and aggressive weed that the farmers had ever been troubled with. From 1893 to 1897 most alarming reports in regard to it were received at the Department of Agriculture. In some instances it was stated that valuable farms would have to be abandoned unless some means could be devised for keeping it in check. The danger period seems now to be past. The prickly lettuce has either found natural enemies which keep it in check, or for some reason it has lost much of its aggressive character. It is becoming much less abundant in regions where it formerly occupied nearly all the waste land and many of the cultivated fields, and the individual plants are generally less robust and less prolific than they were six to ten years ago.

All of the scores of specimens of the weed examined agreed with each other in their essential characters, and all were called *L. scariola* until within the past three years. In August, 1901, a specimen was received at the Department of Agriculture for identification, from Plainville, Hamilton Co., Ohio. This specimen differed from all others that had been examined in having runcinate or pinnately-lobed leaves. A careful study of the early descriptions proved that this form must be the true *L. scariola*, of Linnaeus. If this was *L. scariola*, the common form with unlobed leaves certainly was not, and for the first time in its history of nearly 40 years as a weed in this country its real identity became a matter of importance. A reference to the descriptions of Lactuca given by Linnaeus, and to some of the plates referred to, seemed to indicate that it was *Lactuca virosa* L. This is one of the species included with *L. scariola* by most English authors, who regard it as an entire-leaved form of that species. Dr. Britton's Manual of the Flora of the northern States and

Canada was in press at the time the specimen from Ohio was being studied. Attention was called to the misidentification of the plant, and *Lactuca virosa* was inserted in the appendix.

Since then the writer has examined several specimens from the Gray Herbarium and all of the Lactucas in the Herbarium of the Missouri Botanic Garden, and also in the Herbarium of the Field Columbian Museum as well as the U. S. National Herbarium. These collections include several European specimens of both *L. virosa* and *L. scariola*, the correct identification of which is not to be doubted. These two species are abundantly distinct, but our common prickly lettuce does not agree with typical forms of either species.

There was one specimen from the Gray Herbarium agreeing perfectly with our common form with merely dentate leaves, and labeled *L. scariola integrata*, Gren. et Godr. A further study of specimens and descriptions seems to prove that this is the correct solution of the three-cornered puzzle. The common prickly lettuce, having leaves without lobes, is *L. scariola integrata*, Gren. et Godr. Fl. France, **2**: 320, 1850. The true *Lactuca scariola* is rare in this country, except in the central Ohio valley and *Lactuca virosa* is not found here at all.

The original description of *Lactuca virosa* in Linnaeus Species Plantarum[1] included also *L. scariola* and two illustrations are referred to in Morrison's Historia. One of these figures shows a plant with merely dentate leaves and the other with lobed leaves. Three years later Linnaeus published in Centuria II[2] his discription of *L. scariola* referring to the figure with lobed leaves in Morrison's Historia, and furthermore stating that *L. scariola* "differs from *Lactuca virosa* (from which it is to be distinguished) in the vertical not horizontal plane of its leaves." The leaves of both forms in this country are turned in a vertical plane, and also to the north and south, when the plants grow in the open so that they are exposed to the light.

The true *Lactuca scariola* has been collected on ballast at New York, on the site of an Italian railway construction camp in Washington, and in Ohio, Indiana and Kentucky it is abundant within a hundred miles of Cincinnati. In Washington it does not spread, although the variety *integrata* is an aggressive weed there.

Aside from the leaves there seem to be no characters distinguishing the species from the variety, and a few specimens among the

[1] Sp. Pl. 795 (1753).

[2] Centuria II (1756). Reprinted in Amoen. Acad. **4**: 328 (1759).

large number examined show some intergradation. Intergrading forms have been observed growing together at Lexington, Ky.

The principal distinguishing characters of the three forms are pointed out in the following descriptions:

Lactuca virosa has oblong-obovate obtuse leaves, rather thin and weak in texture and inclined to be bullate. So far as can be determined in pressed specimens they are horizontal. The achenes are black or very dark, with a comparatively short stout beak.

The leaves of *L. scariola* are runcinate, or pinnately lobed, firm in texture and with or without spines on the back of the midrib. They are turned in a vertical plane. The flowers are smaller than those of *L. virosa* and the achenes, also smaller and more slender, are light brownish-gray, usually mottled and with long slender beaks.

The leaves of *L. scariola integrata* have nearly parallel margins, with usually a broadly deltoid acute apex, and a firm texture. They are turned in a vertical plane and the midrib is either with or without spines. The flowers and achenes do not appear to differ from those of the species.

The flowers of both the species and the variety are yellow, but in the dried herbarium specimen they change to blue.

Washington, D. C.

Ledum palustre, var. dilatatum on Mt. Katahdin. — While examining with Professor E. B. Delabarre some Labrador material of *Ledum palustre*, L., and its var. *dilatatum*, Wahl., I was surprised to find in the Gray Herbarium a beautifully fruited specimen of the characteristic var. *dilatatum* collected by the late George Thurber on the summit of Mt. Katahdin, Maine, in August, 1847. The Thurber sheet is labeled "woods & summit of Katahdin, Me.", and contains two branches; one, a loosely forking branch of typical fruiting *L. groenlandicum*, apparently from "woods," the other, a dwarfed and small-leaved branch of heavily fruited *L. palustre*, var. *dilatatum*, obviously from the "summit."

Ledum palustre of Arctic regions presents two strongly marked variations, the true *L. palustre* with narrowly linear rigid leaves 1 to 3 cm. long, and the var. *dilatatum* with leaves linear-oblong as in *L. groenlandicum*. From the latter species of Greenland and boreal America, which commonly has 5 to 7 stamens and narrowly oblong or

cylindric capsules, both *L. palustre* and its variety differ in having more stamens, commonly 7 to 11, and ellipsoid-ovoid shorter capsules. *L. palustre*, var. *dilatatum*, extends south to Newfoundland, has recently been found by Mr. F. F. Forbes in Matane County, Quebec, and is probably the form reported by some authors from the Great Lakes. Its presence on Mt. Katahdin indicates that careful search may show it on other New England mountains.— M. L. FERNALD.

FURTHER NOTES ON ARABIS LAEVIGATA AND ASPLENIUM TRICHOMANES IN MAINE. — May I venture to correct Mr. C. H. Knowlton's statement, RHODORA 6, 208, that *Arabis laevigata*, Poir., had previously been reported only from North Berwick? The plant has never, in my knowledge, been collected in North Berwick. In South Berwick, I have found it at two stations: in company with Mr. M. L. Fernald, on 13 June, 1895, I found a considerable quantity of it along the cliff forming the western side of "The Gulf," and have since collected it there several times; I have also collected it on the ledges around the Parker granite quarry. Both stations are in the "Tacnic," or "Tatnic," region in the northeastern part of the town. Geographically, the difference in location is slight; but it may be of service to some other collector to know the exact locality, as the only place in North Berwick where one would think of looking for plants of similar habitat is Bauneg Beg Hill, some eight miles away in the extreme northern section of the town.

Asplenium Trichomanes, L., noted by Mr. Knowlton from Livermore, also grows on dry shaded ledges near Rumford Falls (*W. H. Allen* & *J. C. Parlin*). —J. C. PARLIN, Brownville, Me.

ON TRANSLOCATION OF CHARACTERS IN PLANTS.

R. G. LEAVITT.

SEVERAL monstrous forms exhibited by native plants have been shown me lately by members of the New England Botanical Club. A consideration of the possible meaning of the anomalies has lead to certain suggestions, which, if correct, are widely applicable. The

instances first to be described seem to me to point to a principle in the operation of the plastic forces, which the illustrations adduced in the later portion of this paper[1] tend to confirm as a principle of normal evolution.

An anomalous Gentiana crinita. — About September 10th, 1903, Miss F. C. Prince collected at Petersham, Massachusetts, a branch of the Fringed Gentian. It bore several blossoms, one of which Miss Prince found to be abnormal. The flower was sent to the Gray Herbarium, where it was turned over to me for examination and remark. The abnormality pertains to the gynoecium alone. There are three pistils. One, centrally placed, is normal. The two supernumerary ones, somewhat smaller than the first, arise from the receptacle. One of them consists of but a single ovuliferous carpel — the normal condition is bicarpellary — dilated above to form the usual stigma. It is not closed; the ovules are, therefore, exposed. The other supernumerary pistil is bicarpellary, but the carpels are united to less than half the height of the ovary. One of them bears a normal stigma. The other is remarkable in being petaloid — though ovuliferous — especially above the point at which the carpels cease to be united. The petaloid character is seen not only in the texture and veining, but most strikingly in the border of the organ, which is fringed in precisely the same manner as are the lobes of the corolla. The correspondence of the fringe of this carpel with that of the corolla extends to details of length and shape of segments, and relation of the segments to the veins. These facts will be of value when we come to consider the significance of the abnormality.

Drosera rotundifolia. — Last summer Mr. Fernald sent me from Grand River, Gaspé Co., Quebec, a number of live plants of the common Sundew. The inflorescences which they bear are few-flowered and capitate, and the flowers themselves are quite sterile. The perianth, and in many cases the carpels, are aberrant, having, with little increase in size, taken on approximately the form of the foliage leaves of the species. The glandular tentacles peculiar to the genus are present in many instances both on the perianth and on the transformed carpels. Sometimes the latter are found to be conjoined at the base to form a short tube, representing the normal ovary. Above this tube the carpels are dilated, rotund, and tentaculiferous.

[1] Contributions from the Ames Botanical Laboratory, No. 3.

I have examined the tentacles with care and ascertained that they have the microscopical structure of tentacles of the foliage leaves. Those of the disc terminate in capitate glands; those of the margin, in linear or spatulate expansions supporting the elongated glands on the upper surfaces. Thus the state of affairs found in the vegetative leaf is exactly reproduced. Here again to be borne in mind is a detailed correspondence between abnormal characters of the modified member and normal characters of another part of the plant.

A parallel anomaly in *D. intermedia* was described by Planchon in his monograph of the Droseraceae.[1] Carpels became leaf-like in the way described above for *D. rotundifolia*. In one case a foliar member of the flower evinced its carpellary nature in a terminal style-like structure, cleft and bearing stigmas. Planchon observed anomalous structures which seemed intermediate between hairs [tentacles] and ovules; that is, they combined features peculiar to ovules with others characteristic of Droseraceous tentacles. Similarly formations mingling the characters of tentacle and style were found. Discussing the meaning of these confused forms Planchon says: "Although conclusions as to the normal state of organs, to be drawn from teratological facts, are more liable than any others to take the turn which the imagination would lend them, it is none the less certain that the study of them alone is able to give the key to a thousand interesting problems. To say, for example, that hair [tentacle], ovule, and style are (in certain cases) different names for the same organ, of which the form and functions are modified, is to advance a kind of paradox; and yet this is nothing less than one of the consequences of the natural facts which have just held our attention."

Saxifraga virginiensis.— For several seasons Mr. J. H. Sears of the Peabody Academy of Sciences at Salem, Massachusetts, has found at a certain station in Essex a singular form or variety of the common Saxifraga in which the petals are replaced by stamens. Normal specimens have ten stamens and five petals. Mr. Sears's plants have fifteen stamens, of which five stand in the places of the absent petals. In current phrase petals have been transformed into stamens. This kind of abnormality, termed by teratologists staminody, is of rather rare occurrence. One of the few reported cases is

[1] Ann. Sci. Nat. Bot. sér. 3, 9: 84.

that of a congener of *S. virginiensis*, namely *S. granulata*. Staminody has also been observed in Yucca, Asphodelus, Digitalis, Capsella, and Phaseolus. For the present species, *Saxifraga virginiensis*, it was described by Sterns[1] in 1887 from a colony of plants found on Manhattan Island. As Sterns judged that the anomaly is propagated by seed, he proposed to establish a variety, *S. virginiensis*, var. *pentadecandra*. In some of his plants the stamens were deformed and occasionally pistilloid. Going on to discuss the meaning of the perverted forms. the author says: "Is this identity of variation in *S. granulata* and *S. Virginiensis* a mere coincidence? Or have we here a striking case of atavism? Is this variation the recurrence, in the descendants, of the peculiar and long obsolete structure of their common ancestor? Was the progenitor of the hundred and sixty or more distinct *Saxifragae* of to-day a plant with apetalous and fifteen-stamened flowers? We shall never know with certainty, but two of its descendants testify strongly in the affirmative. I would even go a step farther, and hazard the conjecture that the original of the Saxifrages was dioecious, or at least polygamous. In the two perfect plants I have described the stamens were remarkably vigorous and well developed. In the ten or more others the stamens, as I have said, were singularly imperfect, and numbers of them were curiously ovary-like in appearance. Is it possible that these plants were blindly struggling to reproduce a primitive pistillate form?"

The Significance of Monstrosities.— Much attention has been given to monstrosities, and the literature of the subject is vast. A cursory résumé of it, up to 1890, occupies some 1106 pages in Penzig's useful *Pflanzenteratologie*. The voluminousness of the record is attributable, first, to the interest excited in observers by the unexpectedness of the phenomena; secondly and more significantly, to a more or less conscious assumption, widely entertained, that the apparent vagaries of nature when rightly understood will throw much light upon the morphological nature of normal plant structures and the modes of evolution.

What kinds of significance may monstrosities be deemed to possess? — It is evident that every formation of the plant body, whether normal or abnormal, is an expression of the physiological forces operative in growth. The occurrence of an aberrant form

[1] Bull. Torr. Bot. Club, **14**: 122 (1887).

denotes disturbance of the ordinary physiological factors. In the present paper it is not meant to inquire what the nature of this disturbance is. It is intended to ask only what application teratology may have to the problems of evolution. The answer which, in effect, has been made is this, that teratological phenomena bring us desired information from at least two different sides. In the first place, abnormalities have often been held to represent the restoration of ancient forms and to reveal the original condition of organs; certain abnormalities, in other words, have been regarded as displays of atavism. When this is their true nature they show us certain definite points which lines of evolution have followed. The remarks of Planchon and of Sterns quoted above exemplify this concrete application of the phenomena. Interesting attempts to use teratological forms in the interpretation of normal structures, wherein the atavistic nature of the occurrences is assumed, are to be found in the controversies regarding the morphology of the ovuliferous scale of the Abietaceae; in discussions of the origin of the Angiospermous ovule; and recently in Dr. Davis's attractive elucidation of the derivation of the archegonium.[1]

Secondly, abnormality as a general broad phenomenon has, especially of late, attracted to itself a strong current of biological thought, by reason of its relation to the ideas of "discontinuous variation" and "mutation." An original, suggestive, and philosophical treatment of monstrosity in general, considered broadly as a phase of organic development, and in its bearing on evolution, is the work of Casimir de Candolle.[2] He recognizes the parallelism between certain types of abnormal deviations and certain demonstrable trends of evolutionary progress in flowering plants. It is worth while to quote the concluding sentences of the essay mentioned. "If teratological variations of floral organs have played a rôle in past evolution, those which have led to present complex forms are to day the rarest, while the monstrosities now the most common indicate, in phanerogams at least, a tendency toward primitive simplicity of forms. Consequently if progressive taxonomic monstrosities of the flower were not in other times more frequent and especially more varied than they are to-day, they could not have produced, by the sole effect of natural selection,

[1] Ann. Bot. 17: 477 (1903).

[2] Arch. Sci. Phys. et Nat. Genève, Mar. 1897.

that evolution which is regarded as having eventuated in the most complex floral structures of our times." From such studies of abnormality as De Candolle has made the fullest significance of teratological formations is to be gathered.

So-called reversions among monstrosities.— Such malformed carpels as those of Mr. Fernald's Drosera are not infrequently spoken of as reversions. But the term reversion itself is to be understood in at least two senses. As Gray's *Structural Botany* has been the schoolmaster to bring most of us to the study of morphology, and as the treatment of floral malformations in that work has probably been misunderstood, Dr. Gray's attitude had best be defined.

Dr. Gray's Views of Reversionary Monstrosity.— In the *Structural Botany* Dr. Gray says that in the vegetable kingdom monstrous forms often elucidate the nature of organs. Three pages are therefore given to the subject.[1] Abnormal forms are introduced as one of the two chief kinds of evidence upon which we may rest the doctrine of the unity of type existing among all kinds of foliar appendages of the stem. The readiness with which essential organs are transformed to petals and even to vegetative leaves appears to Dr. Gray to show that stamens, carpels, and foliage leaves are homologous. "The commonest of these changes [abnormalities] belong to what was termed by Goethe *retrograde metamorphosis*; that is, to *reversion* from a higher to a lower form, as of an organ proper to the summit or center of the floral axis into one which belongs lower down."

The use of the word "reverson" and the statement that essential organs of the flower and foliage leaves are homologous, appear at first sight to represent the abnormalities in question as reversions in the phylogenetic sense. To take the words in this sense would, however, be to attribute to Dr. Gray a view which he has not maintained in the *Structural Botany*. When we seek for definitions of homologous, we find a studious avoidance of any suggestion of historic community of origin for homologous structures. *Homologous* is defined as being "*of one name or type*," i. e. "*ideal plan or pattern*." Organs are homologous with leaves which "accord with leaves in mode of origin, position and arrangement on the axis or stem." When, therefore, abnormal flowers show that pistils and stamens are the homologues of leaves they merely demonstrate that

[1] Structural Botany, pp. 171–173.

these organs accord with leaves in mode of origin, position and arrangement; or at most that they are of one name, ideal plan, or pattern. There is no implication of common historic origin. Similarly "reversion" means in Dr. Gray's language no more than descent in the scale of forms subsumed under the ideal conception or type, Leaf. "The substance of the doctrine [Goethe's doctrine of metamorphosis] is *unity of type*" (p. 169). Dr. Gray's "reversion" is the "retrograde metamorphosis" of Goethe.

In the section on monstrous floral structures Dr. Gray uses the word reversion in this abstract sense, with no connotation as to the phylogenetic derivation of the organs in question. This attitude is betrayed by the expression (p. 172) "the reversion of the pistils to stamens." The author of the *Structural Botany* could not have held that pistils have been derived historically from stamens. His presentation of the teratological facts, however, is entirely permissible if the word reversion is understood in the older sense. Throughout the section on the morphology of the flower, Dr. Gray's position is that of Wolff, Goethe and De Candolle, whose researches, with the later investigations of phyllotaxy, Dr. Gray holds to have completed the evidence of the morphological unity of foliaceous and floral organs (p. 168). While at the present time we may safely enlarge our definition of homologous; and while the conclusion that floral appendages and vegetative leaves are homologous rests on a basis far broader than that of phyllotaxy, transition and "retrograde metamorphosis," yet Dr. Gray's treatment of monstrous forms is unimpeachable. He does not venture far into a field in which he doubtless descried numerous pitfalls.

However, the employment of the word reversion by the older writers has doubtless contributed to the confidence with which some subsequent authors have given utterance to unwarranted interpretations. Observers of to-day are imbued with the ideas of the descent theory; they have taken up the term "reversion" and have applied it in a new way in consonance with modern evolutionary ideas. Their reversions are therefore, as they suppose, genuine reappearances of ancestral traits, or restoration of organs to conditions from which they have departed in the course of evolution.

(*To be continued.*)

Arenaria macrophylla in Connecticut.—*Arenaria macrophylla*, Hook. was found by the writer in full flower on May 22d last, growing in the thin soil covering trap stones on the eastern slope of Bluff Mountain in North Guilford, Connecticut, about ten miles from the coast and at an altitude of four hundred feet. Three weeks later it was fruiting freely, the flowers having all disappeared. Only a small patch was observed in a little open slightly grassy place, partly in shade of White Pine and some small deciduous trees. The petals are a little longer than the sepals, otherwise it corresponds to the description in Britton's Manual and with specimens of the same plant collected by W. W. Eggleston, in Proctorsville, Vt., which is believed to be the only other reported New England station. The Connecticut station seems to be decidedly out of, and much South of its hitherto known range. — George H. Bartlett, North Guilford, Connecticut.

A Connecticut Station for Lycopodium Selago.—In the Gray Herbarium I find a small but well fruited and unmistakable specimen of *Lycopodium Selago*, L., collected in a cool shaded ravine near New Haven, Connecticut by Mr. John A. Allen in 1879. The plant was evidently sent by Mr. Allen to Dr. Sereno Watson in whose hand the label is written. This specimen seems never to have been recorded and certainly has been overlooked in recent years. It is of interest not merely as a voucher for a plant new to the known flora of the state but as extending a generally alpine and boreal species to the southern coast of New England. The nearest hitherto recorded station is Mt. Holyoke, Massachusetts, where the species was collected in 1903 by Professor George F. Freeman (See Rhodora v. 290).— B. L. Robinson, Gray Herbarium.

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ON TRANSLOCATION OF CHARACTERS IN PLANTS.

R. G. Leavitt.

(*Continued from page 19.*)

The significance of the abnormal forms above described.— Since I hold that the reality of alleged atavism is always to be judged in the light of all related facts in each instance, and that teratological evidence alone is never conclusive, I proceed now to consider whether the abnormal forms described at the beginning of this paper can in view of our present knowledge be regarded as *reversions*, in the modern understanding of the word; and concluding that they cannot be so understood, I shall offer another explanation.

Drosera rotundifolia.— We have seen that certain of the carpels of the deformed flowers have taken on the form and produced the peculiar appendages of foliage leaves with exactness. To assume that this modification constitutes a reversion would be to assume that the foliage leaf of to-day closely conforms to the original from which the present Droseraceous carpel as a distinct organ has descended. But it is safe to say that the carpel of Drosera had its origin in common with that of other Angiosperms. It runs back through a series of forms, none of which is a foliage leaf, to the sporophyll of the earliest Angiosperms. Likewise, the foliage leaf of Drosera is a derived structure, probably more recent than the family Droseraceae, even. Its peculiarities arose subsequently to the establishment of the Angiospermous, and even the Droseraceous, carpel. It is likely that the differentiation of spore-bearing leaf (sporophyll) and vegetative leaf antedated even the period of the first flowering plants. To reach a point where the vegetative and

reproductive functions were united in a single foliar organ we must probably go back into the fern-like ancestry. The common original of modern Angiospermous foliage leaf and carpel, then, was in all probability a kind of fern frond. The aberrant carpel of Drosera bears no resemblance to a fern frond.

It is evident that the abnormal carpel does not reproduce a form from which it has been derived, but rather has taken to itself properties of a coördinate derivative member, the foliage leaf. The abnormal carpel is not, therefore, in any strict sense reversionary. But it may be held that the phenomenon is ativistic in its general tendency. This however is not the case. If we inquire which of the two states, the normal carpellary, or the tentaculiferous vegetative condition, is more original — that is, whether the leaf or the carpel is more like the common sporophyll ancestor — then we shall have to answer that the carpel is the more conservative. In one important respect only, in that it is a free and independent part, is the leaf less modified. In its anatomy, consistency, and shape, neither of the members is much like the probably fern-like original sporophyll. But certainly the leaf with its very peculiar appendages and physiological activities is the more highly specialized. Also it has lost the power which the original sporophyll possessed of forming spores. The carpel retains this important reproductive function and is still capable of doing some assimilatory work. This general estimate of the relative position of the two kinds of organs in the evolutionary scale, which makes the carpel the more primitive, is supported by a recent judgment of Bower's.[1] "The inflorescence, or flower, on this view, though produced later than the vegetative region in the individual life, embodies the more primitive parts, viz., those which bear the sporangia and spores. The vegetative region is in its origin mostly if not wholly, secondary."

In the phylogenetic meaning, then, the monstrous carpels of Drosera are not retrogressive; on the contrary the metamorphosis is, in a sense, progressive.

Gentiana crinita.— In Miss Prince's Gentian, similarly, the relation of things in evolutionary time is fortunately clear. The fringe of the corolla lobes, being specific, is a late feature. It is supposedly not so old as the generic characters. The carpel on the other hand

[1] Science, **20**: 532 (1904).

is an ancient structure. When the abnormal carpel puts on the fringe it displays a character not to be found in its own phylogenetic line. Simply the fringe is borrowed. There is no reversion.

Saxifraga virginiensis.— It is more difficult to pronounce upon the nature of staminody in Mr. Sears's Saxifraga. Petals may well have arisen by the sterilization of stamens. And if so, the replacement of petals by stamens might be considered as a kind of reversion. But the stamen from which the petal of our Polypetalae was derived (if from any) was not Saxifragaceous; and therefore the supernumerary stamens of *S. virginiensis* stand for the originals of the petals only in a very general way, at most. Staminody, which as stated above is found in several widely separated families, is of interest chiefly in conjunction with the opposite conversion, viz., that of stamens to petals, an anomaly of very much commoner occurrence. When we consider the two phenomena together it becomes evident that if one of them is in the nature of reversion, the other cannot be. Indeed, to my mind neither of the abnormalities is atavistic. The actual character of the change is, I believe, the same as that which we have seen in the cases of Drosera and Gentiana just discussed. By anticipation in the development of the flower, characters of one whorl of organs have passed to a lower circle. Staminody and petalody are phenomena merely of replacement.

Morphic Translocation.— That which has occurred in these three illustrative cases may perhaps best be grasped under the idea of morphic translocation. The essence of the facts I conceive to be this: that structures which historically have been developed in certain parts of the plant body have suddenly made their appearance in other parts. Droseraceous tentacles we may suppose were the product of a long process of evolution, in the course of which originally sessile glands became stalked, and the stalks acquired an internal mechanism securing flexibility and the transmission of stimulus. These highly remarkable organs were developed as parts of the foliage leaf. Now of a sudden they appear upon the sepals, petals and carpels. The fringe of the Gentian came into being as a structure of the corolla and possibly plays a part in the economy of the flower. By a jump it now appears upon the carpel.

In the infinite variety of monstrous forms there are many of a different nature from those which have here been the subject of discussion. Oftentimes new patterns and conformations appear for which no

antecedents are to be sought in the normal composition of the plant body. These and other categories of abnormalities are of interest to the student of evolution. It is my purpose to deal here with only one kind of changes, of which I have endeavored to point out the real character. It would be a profitable labor to discover the modes and limits of morphic translocation as exhibited in monstrous forms. At present I shall merely add to this part of my remarks a few wôrds upon the weight of teratological evidence in certain recent discussions of homologies.

Criticism of recent arguments from teratological premises. — In the egg apparatus of the embryo sac in flowering plants are three cells, of which one is larger than its two neighbors. The large cell is the egg, the smaller ones are the synergids. The egg-cell is held to be the last vestige of an archegonium, the accessory parts of which have been lost — unless the synergids represent the parts. What portions of the original archegonial or prothallial arrangement the synergids represent is wholly obscure. But it has been found that occasionally one of the synergids becomes capable of fertilization, *i. e.*, becomes an egg cell. Some writers have held this exceptional behavior to show that the synergids, as potential egg-cells, are degenerate egg-cells in fact, historically coördinate with the egg proper. Again, in the venter of the archegonium of Pinus there are two cells. One is large and destined to be fertilized, the egg. The other, or ventral canal cell, is small and transitory. Rarely, however, the latter cell becomes enlarged and in all visible respects egglike. This abnormality is regarded by Coulter and Chamberlain,[1] as strong evidence in favor of the conclusion that "the ventral canal cell represents an abortive egg, which is occasionally organized as an egg, and which may rarely function as one." In the cones of the Abietaceae the ovuliferous scales have sometimes been found more or less perfectly replaced by leaf-bearing shoots. From this it has been argued[2] by Braun, Caspary, Parlatore, Oersted and others that the fertile scale is morphologically a reduced branch in the axil of the sterile one.

As far as the teratological facts themselves are concerned, without the aid of the more important collateral evidence, these three cases

[1] Seed Plants, p. 87.

[2] Summary and references in op. cit., ch. III.

are ambiguous. They may or may not be genuine instances of reversion. They are possibly assignable to the category of translocations.

They would, however, be highly suggestive as independent sources of evidence, were it not that it can be clearly demonstrated that organs may be replaced by non-homologous organs, or may combine in themselves along with their own proper characters, the attributes of organs with which they are not homologous. Modifications of the Angiospermous ovule are especially instructive on this point. Masters has assembled[1] in his Teratology many accounts, from which it appears that, in addition to the modification described above from Planchon, ovules may be replaced by whole anthers, whole pistils, leaflets, whole leaves, and finally leafy shoots. The fusion of characters may be in any proportion. Thus in *Passiflora coerulea*, Salter[2] found a complete series of formations connecting anthers and ovules. "The pollen-bearing ovules were borne on the edges of these ovaries, and presented various intermediate conditions between anthers and ovules, commencing at the distal extremity of the carpel with a bilobed anther, and passing in series to the base of the ovary, an antheroid body of ovule-like form, a modified ovule containing pollen, an ovule departing from a perfectly natural condition only in the development of a few grains of pollen in its nucleus, and, finally, a perfect, normal ovule." Similarly Berkeley[3] found in a Carnation the characters of ovules and pistils blended in various degrees. Wigand[4] explicitly states that in *Reseda alba* he observed ovules in all stages of shoot-formation. The conversion of the nucellus to a branch has also been observed in Alliaria (Sisymbrium) and Nigrella. It is plain that whatever the morphology of the ovule, it cannot be the homologue of *all* the structures enumerated above, whose details it occasionally borrows. And these considerations throw much doubt upon the teratological evidence, considered as self-sustained testimony, supposed to reveal the nature of synergid, ventral canal cell, and ovuliferous scale. Before the abnormal formations can be held to be significant in a phylogenetic way, it must be shown that they are not to be classed with these various modifications of the ovule, as phenomena of morphic translocation.

[1] Vegetable Teratology, pp. 262–271. [3] *L. c.*, 267.
[2] *L. c.*, 186. [4] Grundlegung des Pflanzen-Teratologie, p. 39.

Characters may pass from members of one kind to those of a morphologically different kind. Morphic translocation seems usually to be conditioned not by homology, but by similarity in the developmental substratum. The rudiment of an ovule, which is an emergence of the placental tissue, is much like that of the Droseraceous tentacle; this I can attest from a study of the development of the latter organ. It is also like the beginning of the leaf at the summit of the stem. The partly developed nucellus is a mound of embryonic tissue not unlike the growing stem tip. When vegetative impulses invade the flower the formative forces seize upon the ovular or nucellar rudiments and mould them into vegetative organs, such as are normally produced in the vegetative parts from similar originals. The ovules, or rather their substitutes, then appear as tentacles, leaves, etc., even as whole leaf-bearing shoots.

I have not here discussed the merits of the questions at issue, but have criticized the arguments. However, in the case of the enlarged ventral canal cell, it seems to me that reversion, in any true sense, is extremely unlikely. To find an archegonium-like organ in which more than one gamete was a normal condition, we should have to go back over an enormous stretch of history, certainly to the predecessors of the lowest Hepaticæ, perhaps into the Algæ. I know of no clear indication that characters remain latent for such lengths of evolutionary advance. Characters clearly Pteridophytic do not appear anomalously in Angiosperms, nor Bryophytic anomalies, so far as I am aware, in Ferns. The approximation of the ventral canal cell to the egg in size and structure is probably brought about in the way already suggested: a character which in the course of normal events has been evolved in one member, the egg, has thereby become potential for another member similarly conditioned and of like form in the inceptive stage, and may abnormally become actualized in that other member, the ventral canal cell. *The precedents for monstrosities may thus often be sought in contemporary normal parts, rather than in ancestral conditions.*

Morphic Translocation in Evolution. — While organic chaos would result from frequent substitutions occurring in the normal constructive sequence of ontogenetic development and while great translocational capacity would be antagonistic to adequate permanence of type, yet within certain limits the principle might operate without disastrous results and might even, by introducing new combinations

of old characters, contribute to evolutionary progress. But before the translocational property can be admitted as an evolutionary factor it must be shown to be transmissible from generation to generation.

Two of the cases described early in this paper are in point. Mr. Fernald states that he found the variety of *Drosera rotundifolia* which he has called *comosa*,[1] in great abundance, covering the bog where it grew. When a trait is found thus in very numerous individuals it must be entered in the evolutionary account book. The pentadecandrous Saxifrage seems also to be a fixed form. Sterns judged it to be propagated by seed; and Mr. Sears has written me that he has found it — in not a little quantity, as appears from the amount of material sent to me — at a certain station repeatedly since 1886. The experience of gardeners in the propagation of "double" flowered races of plants, in which stamens have turned to petals, is well known. Such forms of Begonia, the Stock, Hollyhock, Columbine, etc., may be raised from the seed. I may also adduce the experiments of De Vries[2] with an aberrant *Linaria vulgaris*. The flowers were peloric. The spur character had passed from the anterior petal of the gamopetalous corolla to all the other petals and the corolla tube had thus become 5-spurred. In three generations from the seed of peloric plants De Vries found, out of 119 individuals, 106 fully peloric. The form was, therefore, in a high degree, although not fully, true to seed. Changes of organization of the kind here being considered are therefore inheritable, and call for a place in the scheme of evolution.

TRANSLOCATION OF CHARACTERS IN COMPOUND LEAVES, FOLLOWING MODIFICATIONS ARISING IN THE COURSE OF NORMAL EVOLUTION. — With relation to the main theme of this paper I wish now to point out certain aspects of compound leaves. Compounding of the leaf is found in many divisions of Dicotyledons from the most primitive, as Juglandaceae, to the most advanced, as Caprifoliaceae. The compound-leaved groups are separated by entire-leaved allies in such a way that we know compounding to have arisen repeatedly and independently. In families which include some species with entire leaves, others with leaves lobed, parted, etc., and finally some with leaves fully compound, we see, as it were, the compounding in process of development. It is quite certain that this process has been

[1] RHODORA 7: 9. [2] Die Mutationstheorie 1: 562.

repeated many times, so that by universal consent the compound habit is not regarded as a mark of relationship.

Certain leaf characters are common to entire and to compound leaves, and are widely spread throughout the series. Such are stipules, and absciss-layers of cells at the bases of petioles, causing defoliation. These characters may be considered older than the several cases of compounding.

Certain other characters are found only in compound forms, and since they cannot exist in entire-bladed leaves, must be of later historic development than the cases of compounding where they severally occur. Such features are stipels and absciss-layers of cells in petiolules.

These characters, being later than the compounding which they accompany, are later than the stipules and petiolar absciss-layers of the same species, which features are older than the compounding. Moreover stipels and petiolular absciss-layers occur in widely separated families and must therefore have arisen several times independently in the case of stipels, and many times independently in the case of absciss-layers.

Stipels are found in Staphyleaceae — e. g., *Staphylea trifoliata*, *S. pinnata*, *S. Bumalda*, *Euscaphis staphyleoides*, *Turpinia occidentalis*; in Rutaceae — e. g., *Zanthoxylum carolinianum*, *Z. americanum*; in many Leguminosae (Papilionaceae) — e. g., species of Phaseolus, Robinia, Bradburya, Desmodium, Dolicholus, Galactia, Vigna, Amorpha; and in Caprifoliaceae — e. g., *Sambucus canadensis* and *S. racemosa*. In looking over these examples one is struck by two general relations. *First*, in all these cases stipels have been preceded by stipules. *Sambucus canadensis* is usually exstipulate it is true, but *S. racemosa* is stipulate, and on young vigorous shoots of *S. canadensis* itself I have found stipules; the stipulate habit is in the genus and occasionally in the species, therefore, I may add that the stipels are by no means constantly present. *Secondly*, in all cases observed there is a close resemblance of stipules and stipels in the same species. Thus in Staphylea the stipules are relatively long, linear, pale, and membranaceous; the stipels, though smaller, answer to the same description. In *Turpinia occidentalis* the stipules are much reduced, and the stipels also. In *Zanthoxylum carolinianum* and *americanum* the stipules are spiny and rather stout; the stipels agree. In *Robinia viscosa* and other species of the genus, the stipules are

sharp and rigid; the stipels, though weaker are rigid and sharply pointed. In most other Papilionaceae where both kinds of organs occur the stipules and stipels correspond closely in being slight, filiform structures. In *Sambucus canadensis* the stipels are usually terete — occasionally flat and foliaceous — and capitate, with a small glandular depression at the end; the stipules which I found on vigorous suckers were of the same description.

While we may not be able to determine with certainty whether the present peculiarities of the stipules in these species were taken on before or after the appearance of stipels, yet the way in which the two ranks of members accord in detail as they run the gamut of forms is indicative of some fundamental relation between them. I shall define the nature of a possible or probable relation presently.

As to absciss-layers, it is first to be said that the casting of the leaves of deciduous perennials is an active process, and that the result is achieved by the agency of definite cellular structures. Shortly before the time of defoliation active cell-division begins in the tissue at the base of the petiole, where separation is to take place, and a plate of cells is organized. The middle single layer of the plate finally disintegrates and the leaf drops off (when the fibrous strands break) leaving a clean scar.

If one will examine any compound leaf at the time of leaf-fall, he will probably find that as the petiole is disarticulated from the stem, so the leaflets are disarticulated from the rhachis. Eventually the leaf not only falls off, but falls to pieces. Indeed the leaflets often depart while the leaf stalk and rhachis still stand upon the stem held by the fibrous elements, which are not cut in abscission. As far as my observation goes — and I have examined numerous species and groups, ranging widely both taxonomically and geographically — the casting of leaflets is universal in deciduous, compound-leaved plants.

The appearance of the leaflet scars, when compared with leaf scars, at once suggests that the defoliating process is the same in both cases; and the exact researches of von Mohl[1] leave no doubt on this head. The abjection of leaflets is the same structually positive process as that of leaves. At the base of the petiolule cell division sets in, resulting in the organization of an absciss-layer.

We see, then, that in the evolution of compound leaves two kinds

[1] Bot. Zeit. 18:274 (1860).

of structures have arisen bearing a close resemblance to structures previously present. It is to be noted that the secondary features have arisen in situations similar to those in which the antecedent features were already to be found. Stipules arise on the axis of the plant where a leaf is given off; stipels arise on the axis of the branched leaf where a leaflet is given off. Petiolar absciss-layers come at the junction of leaf-stalk and stem; petiolular absciss-layers come at the junction of leaflet-stalk and rhachis.

Furthermore, the secondary features seem to be in the main useless. Certain stipels — as the spinous or glandular kinds — are evidently advantageous, or at least functional. But most stipels are weak affairs for which there is no apparent office. With absciss-layers in petiolules, the probability of inutility is very strong indeed. The dismemberment of the exhausted and now valueless leaf, from which plastic materials have been withdrawn, no longer functionally a leaf but merely the form or frame of a leaf, seems superfluous. While uselessness of apparently unimportant members can perhaps in no case be absolutely proved, yet here the probability of it approximates certainty to such a degree that it may properly become a ground of reasoning. It is plainly within the limits of cogency which must be set in all such arguments as the present, based as they are not upon experiment but only upon observation. I shall assume, then, that for the most part the secondary features in question are useless.

Why have these structures arisen so often, that is repeatedly and independently, in Dicotyledons? And especially why do we find one or both of them present so persistently in spite of inutility? These questions find no answer in the modes of evolution assumed to be the common modes: the formations do not seem to be well accounted for as products of evolution by slow steps under guidance of Natural Selection.

The true account of the structures I believe is that they are repetitions, echoes as it were, of the previously existent parts which they so closely resemble, and that they first made their advent fully formed when the conditions for their production had been matured in the course of the evolution of the leaf. The conditions were the development of a distinct rhachis and petiolule, and the establishment, at their junction, of an allocation of parts very much like the allocation obtaining at the insertion of the petiole upon the stem.

We may say that it is a law of plant building, in certain species, that when a certain arrangement is realized the production of stipule and, eventually, absciss-layer must succeed. When therefore a very similar arrangement is attained in the compound leaf of these species, stipels and absciss-layers follow almost perforce, by the operation of the same structural law of sequence. The repetition of conditions not being perfect, however, the result is not certain in the case of stipels: many compound leaves lack them. But as we have seen, the absciss-layer appears highly constant. The passage of characters from location to location in these instances is comparable to that exhibited by peloric flowers, and by the anomalous forms which stand at the beginning of this paper as a text. Stipels and petiolular absciss-layers, characters of many groups of plants, seem to be effects of a principle which for lack of a better expression I have here called morphic translocation.

The Ames Botanical Laboratory, North Easton, Massachusetts.

A NEW ARABIS FROM RIMOUSKI COUNTY, QUEBEC.

M. L. Fernald.

On July 18, 1904, an unfamiliar Arabis was collected by Mr. J. Franklin Collins, and subsequently by the writer on one of the headlands which characterize the south shore of the River St. Lawrence at Bic, Rimouski County, Quebec. The plant, growing with *Cerastium alpinum*, var. *beeringianum*, *Saxifraga caespitosa*, *Woodsia oregana*, and other high-northern or northwestern species, on dry calcareous ledges, was strikingly canescent, and, with its strongly refracted pods and white petals immediately suggested Hornemann's *A. Holboellii* of Greenland, and its numerous Rocky Mountain allies.

A careful study of the Greenland plant and of authentic specimens or the original descriptions of its known American representatives fails, however, to identify the strange Arabis from the St. Lawrence. In general habit it resembles many of these species, but its nearest affinity is perhaps with the Greenland *A. Holboellii* itself, from

which it is quickly distinguished by the loose hispidulous pubescence of the stem and pedicels, the smaller flowers and the very slender acutish pods. In the pubescence of its stem the Bic plant approaches the Rocky Mountain *A. Holboellii*, var. *Fendleri*, Watson, but that has loosely pubescent or merely ciliate basal leaves, those of the plant from Bic being densely invested (pannose) with minute whitish stellate hairs, its roseate flowers are much larger, and its less refracted broader and blunt pods are on glabrous pedicels.

The Bic plant, which is obviously an isolated relative of a high-northern and Rocky Mountain group of species, is here proposed as new; and it is a great pleasure to associate with it the name of its discoverer, an indefatigable and accurate student of the northeastern flora.

Arabis Collinsii.— Perennial: stems slender, 1 to 3 dm. high, numerous, from a subligneous base, caespitose, erect, slightly glaucescent, below hispidulous with pale simple or forked hairs, above glabrate or glabrous: basal leaves densely rosulate, oblanceolate to narrowly obovate, acutish, slender-petioled, 1 to 2.5 cm. long, pannose on both surfaces with minute canescent stellate hairs, the petiole ciliate especially at base; cauline leaves lanceolate, acute, auriculate or sagittate at base, more loosely pubescent, the margins often ciliate, the uppermost glabrate: flowers at first erect, on stellate-hispidulous pedicels: calyx 3 mm. long; the oblong loosely stellate sepals with white-margined rounded tips: petals white, becoming pink-tinged in age, 4 or 5 mm. long, glabrous throughout: fruiting pedicels strongly refracted, loosely pubescent, 5 to 8 mm. long: pods glabrous, very slender, 2.25 to 4 cm. long, 1 to 1.5 mm. broad, linear, subacute, straight or barely arcuate; the median rib of the valves prominent only toward the base: seeds rather crowded in 2 rows, suborbicular to broadly oblong, 1 to 1.2 mm. long, very narrowly winged above.— Dry limestone-conglomerate ledges, headland in the harbor of Bic, Rimouski County, Quebec, July 18, 1904 (*J. F. Collins & M. L. Fernald*). Type in Herb. Gray.

Gray Herbarium.

PRELIMINARY LISTS OF NEW ENGLAND PLANTS,— XVII.[1]

J. R. Churchill.

[The sign + indicates that an herbarium specimen has been seen; the sign – that a reliable printed record has been found.]

Scrophulariaceae.

	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Bartsia Odontites, Huds.	+					
Castilleia coccinea, Spreng.				+	+	+
" pallida, Kunth, var. septentrionalis, Gray	+	+	+			
Chelone glabra, L.	+	+	+	+	+	+
Euphrasia americana, Wetts.	+	+				
" " " var. canadensis, Rob.	+	+				
" latifolia, Pursh.	+					
" Oakesii, Wetts.	+	+				
" Randii, Robinson	+					
" " " var. Farlowii, Rob.	+					
" Williamsii, Robinson		+				
Gerardia flava, L.		+	+	+	+	+
" maritima, Raf.	+	+		+	+	+
" pedicularia, L.	+	+	+	+	+	+
" purpurea, L.				+	+	+
" " var. paupercula, Gray	+	+	+	+	+	+
" quercifolia, Pursh.	+	+	+	+	+	+
" Skinneriana, Wood				+		+
" tenuifolia, Vahl.	+	+	+	+	+	+
Gratiola aurea, Muhl.	+	+	+	+	+	+
" virginiana, L.	+	+	+	+	—	+
Ilysanthes riparia, Raf.	+	+	+	+	+	+
Limosella aquatica, L., var. tenuifolia, Hoff.	—			+	+	+
Linaria canadensis, Dumont	+	+	+	+	+	+
" Cymbalaria, Mill.				+		+
" Elatine, Mill.				+	+	+
" vulgaris, Mill.	+	+	+	+	+	+
Melampyrum americanum, Michx.	+	+	+	+	+	+
Mimulus alatus, Ait.					—	+
" Langsdorfii, Sims. (M. luteus, au. not L.)						+
" moschatus, Douglas			+	—		
" ringens, L.	+	+	+	+	+	+

[1] Printed in Rhodora as supplementary material.

	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Pedicularis canadensis, L.	+	+	+	+	+	+
" Furbishiae, Watson	+					
" lanceolata, Michx.				+	+	+
Pentstemon grandiflorus, Nutt.				+		—
" laevigatus, Solander			+	+		+
" " var. Digitalis, Gray	+			+	+	+
" pubescens, Solander	+	+	+	+	—	+
" Smallii, Heller						+
" tubiflorus, Nutt.						+
Rhinanthus Crista-galli, L.	+	+		+	—	+
" major, Ehrh.				+		
Schwalbea americana, L.				+		+
Scrophularia leporella, Bicknell	+	+	+	+	+	+
" marilandica, L.			+	+	+	+
Verbascum Blattaria, L.	+	+	+	+	+	+
" Lychnitis, L.				+	+	
" phlomoides, L.				+		
" Thapsus, L.	+	+	+	+	+	+
Veronica alpina, L.	+	+				
" americana, Schweinitz	+	+	+	+	—	+
" Anagallis, L.			+	+		
" arvensis, L.	+	+	+	+	+	+
" Buxbaumii, Tenore	+		+	+		+
" Chamaedrys, L.	—		+	+	+	+
" longifolia, L.	+	+	+	+		+
" peregrina, L.	+	+	+	+	+	+
" officinalis, L.	+	+	+	+	+	+
" scutellata, L.	+	+	+	+	+	+
" serpyllifolia, L.	+	+	+	+	+	+
" " var. borealis, Laestad.	+	+	+			
" Teucrium, L.		+		+		+
" virginica, L.	—			+		+

Verbenaceae.

	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Phryma leptostachya, L.		+	+	+	+	+
Verbena angustifolia, Michx.			—	+		+
" bracteosa, Michx.	+			+		+
" hastata, L.	+	+	+	+	+	+
" stricta, Vent.				+		+
" urticaefolia, L.	+	+	+	+	+	+

Notes on the above List.

Antirrhinum majus, L., common in gardens, is mentioned in some local catalogues (Berzelius Catalogue of Connecticut Plants; Robinson, Flora of Essex County, Massachusetts) as an escape, but doubtfully established. I have not found it in any of the herbaria of New England.

The reports of *Castilleia coccinea*, Spreng., and of typical *Gerardia purpurea*, L., in the Portland Catalogue of Maine Plants, and in Harris's Flora of Windham, New Hampshire, appear to be without foundation.

For a revision of our Euphrasias, with an account of their stations and ranges, reference may be had to Rhodora, iii, 270.

Gerardia Skinneriana, Wood, which is frequent on the southern coast of Massachusetts and Connecticut, is very likely to be found along the intervening shore of Rhode Island.

In determining, with reference to the New England states, the occurrence and range of *Ilysanthes*, I was at first disposed to accept the conclusions of Dr. John K. Small (Torr. Bull., XXIII, p. 296; Aug., 1896) so far as they apply to our New England plant, and to accord specific rank to his *I. attenuata* (*Lindernia attenuata*, Muhl.).

Besides less conspicuous characters wherein this form is claimed to differ from *I. riparia*, Raf. (*I. gratioloides*, Benth.) there is the shortness of the pedicels relative to the length of the leaves. This extreme disparity in the length of the pedicels compared with the leaves, which was frequently concomitant with a habit "stouter and lax," or more procumbent in the one than in the other form, enabled me without much difficulty to deal with a limited number of New England specimens, which ranged themselves fairly well respectively under the desired names.

It, however, early became apparent that the length of the sepals relative to that of the capsule, a distinction upon which stress is laid, was of little or no value as a diagnostic character; and as specimens from New England were encountered which combined, in one collection or in a single plant, pedicels both longer and shorter than leaves, doubts arose, and recourse was had to a careful examination of the abundant material in the Gray Herbarium from all parts of the country, from Canada and from Mexico, of the sheets in the herbarium of the New England Botanical Club and in my own and other herbaria.

This broader view and research only tended to confirm finally the impression that all the supposed distinctive characters of *I. attenuata* are variable, and that there are no differences between the two forms which are specific, constant, or concomitant one with another, or which have even varietal value. Acknowledgment should be made to Dr. Robinson and to Mr. Fernald for advice and co-operation in the investigation.

I may add that I found no specimens with long pedicels from Maine, New Hampshire or Vermont.

Limosella aquatica, var. *tenuifolia*, Hoff., will probably be found on the coast of Maine, but at present the report in the Portland Catalogue lacks confirmation.

While *Pedicularis lanceolata* is credited to Massachusetts, it should be said that it here reaches its northern limit, and is rare and local. I have been able to discover but two collections of it; one, probably a waif, in the herbarium of the New England Botanical Club, labeled, without date, "Middlesex Flora. Loc. Revere, just over the line. Mass. Moody." The other sheet, which was kindly sent to me for examination by Prof. Geo. E. Stone, of Amherst, Mass., was from the herbarium of Atherton Clark, and collected at Prescott, Mass., by the late Prof. H. G. Jesup, in Sept., 1874.

Many waifs belonging to the two families here treated have been reported as more or less established in various parts of New England. Of these the following having been seen in herbaria are included, although with some hesitation, in the columns of the Check-list:—*Linaria Cymbalaria*, Mill., *L. Elatine*, Mill., *Pentstemon grandiflorus*, Nutt., *P. Smallii*, Heller, *P. tubiflorus*, Nutt., *Verbascum Lychnitis*, L., *V. phlomoides*, L., *Veronica Chamaedrys*, L., *V. Teucrium* L., and *Verbena bracteosa*, *Michx.*

The only *Pentstemon* native to New England is *P. pubescens*, Soland., but *P. laevigatus*, Soland. and its variety *digitalis*, Gray, frequently appear in cultivated grounds. *P. grandiflorus*, Nutt. was collected by Dr. Walter H. Chapin in 1898 "in waste land on the edge of the City" of Springfield, Massachusetts, where there were about 100 plants in a small space. Dr. Chapin writes that the species still (1904) "persists and if not exterminated by cultivation will be permanent. The plant, however, has not materially extended its limits." This species has also been reported from Granby, Connecticut, but the report may be based on *P. Smallii*, Heller, collected

there by I. Holcomb in June, 1904, the specimens being now in Mr. Bissell's herbarium.

Mr. Bissell also sent me for examination a specimen of *P. tubiflorus* Nutt., collected by him "in grass land, Salisbury, Conn., July 29, 1904." Both these species have been determined by Mr. Fernald, and occurring thus, far out of their normal range in the South and West, illustrate the migratory habits of the genus.

Rhinanthus. Two of the common European "Yellow-Rattles" are *Rhinanthus Crista-Galli*, L., the species which is common on our Maine coast and local elsewhere in New England; and a larger plant, *R. major*, Ehrh., which has the exserted corolla 1½ to 2½ cm. in length and the bracts yellow at their base instead of green. The nipple-like appendages on the upper lip of the corolla of the larger plant are colored bright purple and are longer than broad, while these appendages in our smaller plant are broader than long and of yellow color uniform with the rest of the corolla, which rarely exceeds 1½ cm. in length.

In the Synoptical Flora (1878) Dr. Gray says our common Yellow-Rattle "varies much in size, but apparently we have no *R. major*, Ehrh.", and the plant is not mentioned in any of our more recent Manuals.

It was interesting therefore to discover in the Gray Herbarium a sheet of veritable specimens of *Rhinanthus major*, marked "Rhinanthus Crista-Galli, var. major. In pratis humidis ad *Plymouth*, *Massachusetts*, Legit Oakes." The label gives no date, but the words quoted do not suggest that the plant was at all transient or scarce, nor is the plant one in its nature likely to disappear in succeeding seasons.

The question then arises where was this station, and do these plants still persist there? A like query which the writer put, in RHODORA, II, 92; April, 1900, as to a long-lost station for *Phaseolus perennis*, was soon answered by our diligent botanists in Connecticut. Let us of Boston go and do likewise, and rediscover the Greater Yellow-Rattle in the dewey meads of Plymouth!

Verbascum phlomoides, L., seems to persist at its only New Eng, land station, Annisquam, Massachusetts, where it was first collected by Professor J. H. Robinson in 1894.

Although but recently observed, *Mimulus moschatus*, Dougl., seems to be a permanent part of the Vermont flora. The writer has found it growing abundantly along a wet roadside in Canada near the Vermont line. It has also been recently reported in Massachusetts.

Specimens of so-called *Veronica agrestis*, L., in the Herbarium of the New England Botanical Club, from Reading, Massachusetts, have been found to be *V. Buxbaumii*, Ten., and reports of *V. agrestis* from New England appear to be without foundation.

Of *Veronica Anagallis*, L., the writer has seen a specimen from Tinmouth, Vermont, where it was discovered by Mr. W. W. Eggleston. There is also a specimen in the Gray Herbarium collected many years ago by Oakes at Ipswich, Massachusetts. This station is now extinct or at least unknown, but the plant is reported from Berkshire County by Mr. Ralph Hoffmann. The species has been recorded from other New England States in various local catalogues, but the writer after much inquiry has been unable to verify these reports and is inclined to suspect that the habitally similar *V. americana* is frequently mistaken for *V. Anagallis*. The latter species must be very rare in New England.

I have been unable to verify the occurrence in New England of the following species reported in divers local catalogues of reliable character, and it has seemed best to omit them from this list, for even if they have been correctly identified they must in most, if not all instances, form only casual and transient features in the New England flora.

Micranthemum Nuttallii, Gray. Bishop's Catalogue, 1901. Connecticut.

Mimulus brevipes, Benth. Middlesex Flora, 1888. Massachusetts.

" *Jamesii*, Torr. & Gray. Bishop's Catalogue, 1901. Connecticut.

Orthocarpus purpurascens, Benth. Middlesex Flora, 1888. Massachusetts.

Verbascum nigrum, L. Essex Flora, 1880. Massachusetts.

Veronica hederæfolia, L. Bennett's List, 1888. Rhode Island.

" *spicata*, L. Middlesex Flora, 1888. Massachusetts.

Verbena officinalis L. " " " "

" " " Bishop's Catalogue, 1901. Connecticut.

Boston.

White Form of Sabbatia chloroides.— A white form of *Sabbatia chloroides*, Pursh, grows on the borders of a pond in East Weymouth, which seems remarkable in that there are hundreds of the plants none of which show the slightest tinge of pink in the flowers. No typical pink flowers can be found nearer than at a pond in South

Weymouth, fully three miles away, where there are a few scattered plants all of which for at least a number of years have borne pink flowers. The white form shows no constant differences from the type except in color. The petals are not greenish nor creamy, but a very pure white, and the brown markings usually found at the "eye" of the pink flowers are wanting in the white form the centre of which is a delicate green or yellow color. The plants seem larger and more vigorous than those of the type, but this is probably due to more favorable conditions for growth. On two sides of the large pond the white flowers are massed so closely together that when seen from the street they bring to mind a field of daisies in early summer. — Alice G. Clark, East Weymouth, Massachusetts.

REMARKS ON RHODE ISLAND PLANTS.

FREDERICK S. BEATTIE.

The following statements apply to collections in Rhode Island during 1904.

Microstylis ophioglossoides, Nutt. — Collected only in Exeter by Prof. W. W. Bailey, about thirty-five years ago, and credited to him in Bennett's List. I found the species on July 30 at South Kingston. Five plants only appeared, in a low, gravelly swamp, in company with *Habenaria ciliaris*, R. Br., *H. blephariglottis*, Torr., *Gaultheria procumbens*, L., and *Oxycoccus palustris*, Pers. They were growing scattered in beds of a Polytrichum, a preference noted in case of some plants of the species collected on July 8, at Fort Kent, Maine.

Taraxacum erythrospermum, Andrz. — Credited to Lincoln by Mr. J. F. Collins (Rhodora, V, 291). On May 29 I collected the species in excellent fruit at Sneech Pond, and on May 30 at Diamond Hill, both in the town of Cumberland. At each locality the red-seeded species was abundant in open woods, on hillsides, principally, and ledges, not venturing into the open at all; while *T. officinale* appeared to keep carefully out of the woods, growing only in the open. About June 11 I found a single plant of *T. erythrospermum*, in good fruit, by the railroad track in East Providence.

Lilium tigrinum, Andr. — This species is new to the state. It is well established in Lincoln, about the quarries at Limerock, growing fairly thickly here and there by roadsides, generally in the shade

and often far from dwellings. Britton and Brown (Ill. Fl. I, 419) state that bulblets are produced in the axils of the upper leaves. The plants of this locality, on August 7, were bearing bulblets in leaves halfway down the stem, and not rarely still lower.

Tanacetum vulgare, L., var. *crispum*, DC. — Already credited to the state by Bennett. It grows more abundantly at Limerock, Lincoln, than does the typical species ; in fact, about the quarries I had difficulty in finding the typical form.

Spiraea sorbifolia, L. — Occurs in Lincoln, in a meadow east of Butterfly Factory. It was originally planted, but has spread under a stone wall into the meadow, and persists after five years of autumnal mowing.

Ornithogalum umbellatum, L. — Occurs in Lincoln about Butterfly Factory, in ditches by the roadside, and in meadows, though rarely blossoming in the latter situation where cropped by cattle.

Sedum acre, L. — Reported in past years by Prof. Bailey from Butterfly Factory, Lincoln. It now extends for over a mile westward, and at least two miles northward, to the east also over a mile, on stone walls, ledges, and in meadows far from the road.

Vinca minor, L. — Established in ditches along roadsides, and on rocky banks, between Butterfly Factory and Limerock, Lincoln. A very common creeper. Mr. R. L. Bowen reports it from Coventry, where a few roots, originally planted by children about a play house in open woods, have made a colony over ten feet across. The species has not been credited to our state by Mr. E. F. Williams (Rhodora, IV, 17). It evidently has gained a firm foothold in Lincoln.

Trillium erythrocarpum, Michx. — I collected a specimen of this on May 21 in Gloucester which possessed two stems proceeding from the same corm. Furthermore, on the flower of one of the two twin-stems, one of the sepals was enlarged to a length five-sixths that of the ordinary leaves, the shape of this sepal also approximating that of a leaf, rather than that of a sepal. While at Rowe Pond, Somerset Co., Maine, about July 1, with Mr. J. F. Collins, I noticed that twin-stems from a corm of this species were the rule. Observations which I made showed that about fourteen out of nineteen plants had them. As far as I could determine from the withered, persistent sepals, however, there was no approach to phyllody.

Brown University, Providence, Rhode Island.

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ON BALLS OF VEGETABLE MATTER FROM SANDY SHORES.

W. F. Ganong.

It happened some two or three years ago that I received at about the same time from two different sources inquiries as to the mode of formation of certain balls of vegetable matter found on the sandy bottoms of shallow ponds. Having myself no knowledge of the subject I sought for some description of them in the accessible literature, but without result. Nor did inquiries addressed to those of my colleagues likely to be versed in such matters elicit any substantial information. Following the subject further, however, I did obtain some facts about them, and, since other interests are not likely to allow me to investigate their mode of formation for myself, I desire to place these facts on record for the benefit of others who may wish to make use of them.

The earliest, and at the same time almost the only, published reference to the balls known to me occurs in Thoreau's well-known book, *Walden*, the first edition of which appeared in 1854. In the Chapter on Ponds, in a description of Flint's or Sandy Pond in Lincoln, Mass., he writes: —

There also I have found, in considerable quantities, curious balls, composed apparently of fine grass or roots, of pipewort perhaps, from half an inch to four inches in diameter, and perfectly spherical. These wash back and forth in shallow water on a sandy bottom, and are sometimes cast on the shore. They are either solid grass, or have a little sand in the middle. At first you would say that they were formed by the action of the waves, like a pebble; yet the smallest are made of equally coarse materials, half an inch long, and they are produced only at one season of the year. Moreover, the

waves, I suspect, do not so much construct as wear down a material which has already acquired consistency. They preserve their form when dry for an indefinite period.

Apparently this is Thoreau's only published reference to the balls. But I am informed by Mr. Francis H. Allen, of West Roxbury, that Thoreau's manuscript Journals now in his possession in preparation for publication by Messrs. Houghton, Mifflin & Co., contain two additional references to them, and these references, by Mr. Allen's kind aid and permission, are here reproduced: —

Feb. 4, 1857. Met Theodore Parker in the cars, who told me that he had recently found in Lake Michigan a single ball five inches in diameter like those I presented to the Natural History Society, though he did not observe the eriocaulon. It was late in the season.

Apr. 5, 1858. In the proceedings of the Natural History Society for December, 1856, there were presented by Dr. H. R. Storer 'a globular concretion of grass said to have been formed by the action of waves upon the sea shore'. Were not these some obtained by the Hoars or Emersons from F. Pond?

The reference in this passage is to the *Proceedings of the Boston Society of Natural History*, Vol. 6 (published 1857), page 93, where the citation given by Thoreau occurs. The specimen itself, however, is not now in the Society's Museum, as I am informed by the Secretary, Mr. Glover M. Allen.

The mention of the balls in a work so notable as *Walden* has apparently drawn much attention to them locally, and has led those of Thoreau's readers who possess scientific tastes to desire further information concerning them. It was for this reason that the first of these balls I had seen were sent me by Miss Madge Palmer of the Packer Collegiate Institute, of Brooklyn. Somewhat later I received a letter (Oct. 5, 1901) on the subject from the late Alfred W. Hosmer of Concord (who speaks of them as grass balls), in the course of which he writes:

The *eastern* side of the pond [Flint's or Sandy Pond] is a shallow place, the bottom of a hard white sand, covered with ripple marks. In these ripple marks there collects decayed eriocaulon, or duck grass, and the prevailing winds in summer being *west*, these bits of decayed grass are gently rolled together, and as the ball forms, it begins a wider rolling, gathering new bits on its way, until they form balls from one to four inches in diameter. If they keep under water while in process of formation, they keep spherical, but if they are washed up to shore, the action of the waves flattens them. Break one open while wet, and it cannot be made to adhere again and will go to

pieces; break one while dry, and it holds. All I have opened have been composed of the same substance all through, and of the quantity I have picked up in the past 8 or 10 years, only two have had a different substance in them. One had a portion of a chestnut burr, and the other a piece of a woody plant with roots on it — the plant was dead, however — this one is egg shaped. As the balls begin to form they are very loosely put together but become matted from long rolling. I find them the latter part of August and first of September, only in the one section of the pond, and then only when the pond is full. . . . . As to their keeping qualities when dry, there is one in the possession of the Concord Antiquarian Society that Thoreau found, and he has been dead 39 years.

Another account of the formation of the Sandy Pond balls has been sent me by Mr. Joseph S. Richardson of Concord, Mass. He confirms Mr. Hosmer's statements excepting as to the precise place of occurrence of the balls, which Mr. Richardson places in a cove at the north side of the pond. More recently I have been able to see, through the courtesy of Professor B. L. Robinson of the Gray Herbarium, a MS. description of these balls, without date, written by William A. Hart and now in the library of the Gray Herbarium. After describing their formation from Eriocaulon stems, the author adds:

The broken stems first collect in the little ripples of the sand; then a changed direction of waves gives them a new motion and they soon form into spheres or cylinders. After attaining some size they roll freely about, in water about two feet deep and less, on the bottom and continue to collect more material. Naturally they form in coves where the eddying of waves is suited for the varied motion necessary to form them. They were discovered by the writer in Sandy Pond, Lincoln, Mass., and so far as he can learn occur elsewhere only in Lake Geneva, Switzerland.

This reference to the occurrence of such balls in Lake Geneva is not confirmed by any information I possess, nor do I know Mr. Hart's authority for the statement, which, however, is very likely correct.

Yet another, and in some respects markedly different description of the Sandy Pond balls has been sent me by Mr. Lincoln Ware Riddle, of Cambridge, Mass., who writes: —

In the summer of 1898 I found over twenty specimens on the northern shore of Sandy Pond, Lincoln, Mass. They are called by the people of that neighborhood, "Burr Balls." There is comparatively little Eriocaulon growing in Sandy Pond; but the shores, especially to the north are bordered by a large number of chestnut trees.

I should say that the balls were composed chiefly of the debris of the chestnut burrs, with some admixture of the veins of rotted leaves. I have found them from an inch in diameter, in which case they are flattened and loosely compacted, up to six inches, when they are perfectly spherical and closely compacted. The northern shore of the pond is shallow for a long distance out, and the prevailing southerly winds of summer would roll the waves on the shore. The summer of 1898 was one of extreme low water; the following years the water rose several feet, and I was unable to find a single Burr ball.

Mr. Riddle is evidently not certain as to the composition of the Sandy Pond balls, and while it is entirely possible that some composed of the debris of chestnut burrs may occur in the pond, it is likely they are all of Eriocaulon, as the other observers have stated. Certainly the several specimens I have received from Mr. Hosmer and Mr. Richardson, and one of which is figured on the accompanying plate, are composed of Eriocaulon almost exclusively.

So much for the information I have obtained about the balls from Sandy Pond. Meanwhile I was shown at Fredericton by Professor L. W. Bailey, of the University of New Brunswick, a very fine specimen, of similar formation but very different material, said to have been found in Kedron Lake in the southwestern part of York County, New Brunswick. Following up the matter I found that it had been obtained by Mr. Wellington Davis of Brockway, N. B., from Little Kedron Lake, and on application to Mr. Davis he sent me a fine specimen together with the following account of its formation: —

It is found in the north end of Little Kedron Lake in a small cove. No wind can strike the cove but from the southeast. It is surrounded with fir and spruce which hang over the water. The bottom is a clear sand. The spills drop from the fir and spruce and lie at the bottom. Then the water washing from side to side forms the ball. No heavy swell comes in there. These balls can be found in no other place in the Little Kedron Lake nor in Big Kedron Lake. Sometimes we have found them from six to eight inches through.

This account, with other matter relating to this subject (practically all included in the present paper), together with a plate showing the ball beside one from Sandy Pond, were published in the *Educational Review* (St. John, N. B.) for August, 1904 (page 51), and it appears in somewhat altered form in the *Bulletin of the Natural History Society of New Brunswick*, No. XXIII, 1905. As Mr. Davis states, the balls consist almost exclusively of the spills (*viz.* leaves or needles) of the spruce, which are interlocked in a very compact and fairly tenacious mass. It is very remarkable that such smooth objects

can thus cling together, but still more remarkable that they should become interlocked in this way in the first place; and one suspects that some cement of micro-organisms must be present to account for their cohesion, something of which the dried specimens show no evidence.

Desiring information as to other localities, or as to other published references to the subject, I published in *Science* for April 8th (1904), a letter asking for such information. It was this letter which brought me the welcome information above given from Mr. Allen and Mr. Riddle; and, in addition, Mr. F. V. Coville of Washington referred me to similar balls from lakes in Idaho, and gave me the name of a botanist, Mr. John B. Leiberg of Athol, Idaho, who was acquainted with them. On application to Mr. Leiberg he kindly wrote me (May 5, 1904) as follows: —

Balls and solid cylinders composed, in the main, of decaying pine needles, bits of comminuted bark and wood, *Ceratophyllum demersum*, leaves and stems of Potamogeta, Charas and Nitellas are of common occurrence in Lake Pend Oreille, in Idaho, and doubtless in Priest and Coeur d'Alene lakes also, in the same State. The balls are small affairs — 4 to 7 centimeters in diameter — while the cylinders vary from 30 to 40 centimeters in length, with diameters from 3 to 5 centimeters. Owing to the great depth of the lakes the balls and cylinders are formed near the shores in water less than 1 meter in depth, and mostly in late summer and fall; the strong gales and heavy wave motion of early winter soon destroy them. The nucleus both of balls and cylinders consists of broken and tangled bits of *Ceratophyllum*, Charas and Nitellas, occasionally mixed with strands of *Zannichellia* and *Naias*. The wave motion rolls the mixture along the bottom and in its progress shoreward pine-needles, decaying splinters of wood bark and similar debris are taken up and become intimately mixed with the primary mass. Infusorial slimes — Amoebas, Vorticellas, etc.— develop and assist in holding the mass together. It is finally cast up on shore where wind and wave soon bring about its disintegration. The balls and cylinders have no local designation.

Mr. Leiberg's account, it will be observed, apparently leaves little to be said as to the mode of origin of the balls in the lakes of his region.

All of the balls so far described occur in fresh-water lakes. I have however seen a specimen, of apparently a similar general nature, from a sea-beach. It was sent me by Mr. Francis H. Allen, and is from Ipswich Beach. As compared with the lake balls I have seen, it is much smaller, far less regular, and of much coarser and more hetero-

geneous materials, — in fact little more than a loosely-matted collection of flotsam hardly brought to a true ball by wave-action.

There remain to add a few facts about vegetable balls of a totally different morphological origin, of which three distinct kinds are known to me. *First*, there are the photo-bezoars, mentioned occasionally in botanical literature, which are formed of matted grass-awns, cactus-bristles, etc. in the stomachs of herbivorous animals. *Second*, the letter in *Science*, above mentioned, was followed by two others in later numbers of that journal (XIX, 926 and XX, 86) by J. Adams of the Royal College of Science of Dublin, giving references to balls formed by the alga Cladophora in Scottish and Danish Lakes. I am informed, however, by Professor F. E. Lloyd and by Dr. M. A. Howe, that the balls formed by these Algae, of which there are specimens in the Museum of the New York Botanical Garden, are of a character quite different from that of the ones we are here considering, for the balls of Cladophora are the result of the normal mode of growth of the plant, and are not simply mechanically-produced aggregations. *Third*, Mr. John H. Sears, of the Peabody Museum at Salem, Mass., writes me (Feb. 9, 1905) that he finds on Ipswich and other beaches a kind of vegetable ball, or "pebble," formed from the matted sods of *Juncus Gerardi*, or Black Grass, thrown upon beaches in ditching operations. These sods are rolled about, worn down and rounded by action of the waves; and they may in addition pick up in the process various other materials,— grass fragments, bits of wood, fish-bones and even sand. Obviously such balls are very different in origin from those of the fresh-water ponds. Mr. Sears also adds that he has found vegetable balls on the shores of Wenham Lake.

There are, therefore, at least four morphologically distinct modes of origin for balls of vegetable matter, and very likely there are also others.

Returning for a moment to the particular kind here under consideration, it seems plain from the descriptions cited that they are simply an incidental mechanical result of the rolling about of light water-logged materials on sandy bottoms by the under-water parts of waves, aided perhaps as to their cohesion by the development of glutinous micro-organisms. On this basis the balls ought to occur wherever this combination of conditions is found, and hence in some parts of most shallow sandy-bottomed lakes; and it is surprising that

they appear to have been so little observed. While this is their probable mode of origin, the subject should by no means be allowed to rest with conjecture, but the genesis and growth of the balls should receive precise scientific study and adequate description.

Smith College, Northampton, Massachusetts.

AN UNDESCRIBED NORTHERN COMANDRA.

M. L. Fernald.

In July, 1903, Mr. George H. Richards collected in the sandy alluvium of the Grand River, Gaspé County, Quebec, a white-flowered *Comandra*, which in habit suggested both *C. umbellata*, Nutt., of the Atlantic States and *C. pallida*, A. DC., of the extreme West. The specimens were not, however, satisfactorily referable to either of those species; so in late June and early July when, with Mr. Richards, I visited the salmon-camp of Mr. Louis Cabot, the present owner of the Seigniory of Grand River, we made it a special point to search for the strange *Comandra*. The plant was found at several stations, but only occasionally in flower. Later in July, it was found in dry sandy woods at Tadousac, at the mouth of the Saguenay, and in September was collected in ripe fruit at the same station.

Study of this *Comandra* of eastern Quebec shows that it is a plant of broad northern range, extending across Canada to Saskatchewan and Assiniboia, south to the Great Lakes, Missouri, and Kansas. Throughout this extensive range the plant holds the characteristics noted on the Grand River and at Tadousac. Compared with *C. umbellata* of the Eastern States,— from central Maine to Wisconsin and Georgia — the more northern species is low, the fertile branches 0.5–2.5 dm. high, those of *C. umbellata* ranging from 1.5–4 dm.; the more crowded leaves are thicker, scarcely paler beneath, and when dry with green inconspicuous reticulate veins, the fewer thinner leaves of *C. umbellata* being somewhat whitened beneath and with the pale midrib prominent beneath. The inflorescence of the northern plant is a rather dense corymb, made up of 2–6-flowered cymules on strongly ascending rays; that of *C. umbellata* is an ellipsoid-oblong panicle with the cymules of smaller more numerous flowers on divergent rays.

This northern plant has only a superficial resemblance to the western whitish-green much firmer-leaved *Comandra pallida*; but it is the plant which has been generally taken by botanists of eastern and central Canada for *C. umbellata*, and under that name it was beautifully illustrated by Hooker in his Flora Boreali-Americana. There is a bare possibility that Michaux also may have had before him specimens of this northern plant when he named his *Thesium corymbulosum*, with "fasciculis florum corymbuloso-terminalibus,"[1] but he cited *T. umbellatum*, L. (*Comandra umbellata*, Nutt.) as a pure synonym and made no other provision for the common Alleghanian plant. Furthermore, there is apparently nothing to show for Michaux's species in his very complete herbarium at the Jardin des Plantes in Paris; and it is probable that, as in case of his *Anychia dichotoma* (*Queria canadensis*, L.), *Monarda coccinea* (*M. didyma*, L.), *Campanula amplexicaulis* (*C. perfoliata*, L.) etc., Michaux's name, *Thesium corymbulosum*, was intended merely as a substitute for the obviously inappropriate Linnean name, *T. umbellatum*.

Rafinesque, in characteristic language, announced in 1836 that "the *Thesium umbellatum* of L. has been well described as a N. G. *Comandra* by Nuttal, but he neglected the species thereof, and so have done all our botanists, there are now 7 or 8 sp. of this G. and I will distinguish 5 sp. of it, all blended by our careless Authors."[2] So far as it is possible to interpret Rafinesque's descriptions, his 5 species seem to be phases of the Alleghanian *Comandra umbellata* and not at all referable to the more northern representative of that plant. This northern species, apparently, has never received the distinctive name it deserves, and I now take pleasure in associating with it the name of is discoverer in eastern Quebec, through whose interest it was possible for me to study the plant in the field.

Comandra **Richardsiana**. Rootstocks elongate, freely branching, superficial or very slightly covered by the loose soil: flowering branches slender, 0.5–2.5 dm. high, very leafy: the strongly ascending green leaves from lanceolate to ovate, obtuse or acute, firm, with obscurely reticulate green veins: inflorescence corymbose, 1–3 cm. broad, of 1 to 6 2–6-flowered cymules on strongly ascending rays: bracts lance-subulate to ovate, mostly exceeding the short pedicels: calyx 3–5 mm. long, cleft to the middle into 5 oblong white (or finally

[1] Michx., Fl. Bor.-Am. i, 112.

[2] Raf., New Fl. ii, 33.

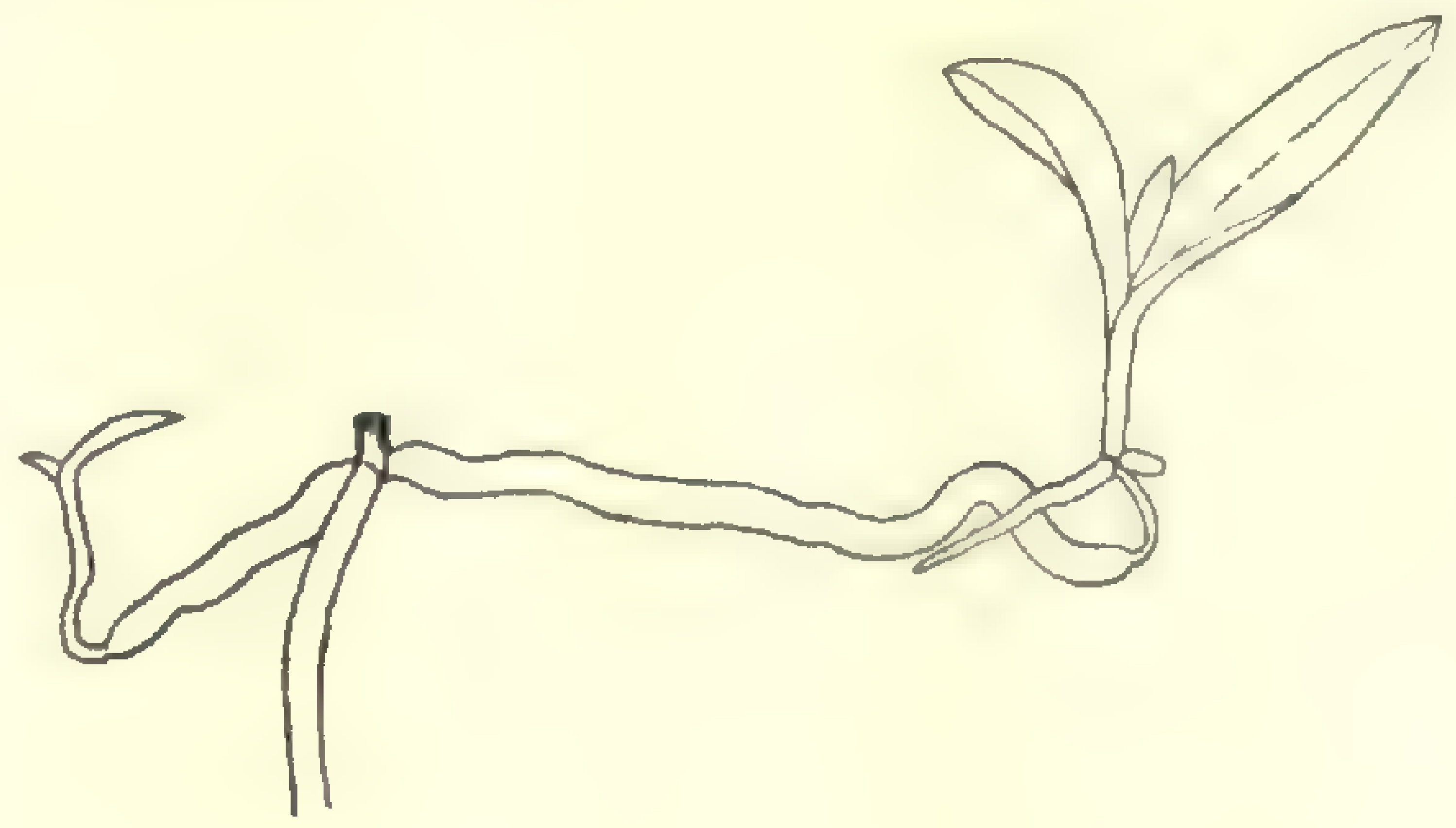
roseate) erect lobes: disc shallowly lobed: drupe dry, greenish-drab as in *C. umbellata.— C. umbellata*, Hook. Fl. Bor.-Am. ii, 139, in part, and t. 179 A, not Nutt.— QUEBEC, sandy alluvium of the Grand River, Gaspé County, July, 1903 (*G. H. Richards*), July 1, 1904 (*M. L. Fernald*); dry sandy woods, Tadousac, July 14, 1904 (*M. L. Fernald*), September 1, 1904 (*J. A. Collins & M. L. Fernald*): ONTARIO, woods near Belleville, May 22, 1878 (*J. Macoun*): MANITOBA, Lake Winnipeg Valley, 1857–1859 (*E. Bourgeau*): SASKATCHEWAN, Cumberland House (*Drummond*): ASSINIBOIA, Sand Hills, Moose Mountain Creek, June 6, 1883 (*J. M. Macoun*): WISCONSIN, St. Croix Falls, May, 1899 (*C. F. Baker*): NEBRASKA, Ponco, June 13, 1893 (*F. Clements*, no. 2519): MISSOURI, dry woods, St. Louis County, May 27, 1877, April 23, 1878 (*H. Eggert*): KANSAS, Independence, 1882 (*E. N. Plank*).

GRAY HERBARIUM.

VEGETATIVE REPRODUCTION OF SPIRANTHES CERNUA.

JOHN GALENTINE HALL.

AMONG the orchids, in spite of the great amount of seed produced, we all know how difficult it is to find seedlings of our native species in their haunts. With this knowledge comes the question, how do they perpetuate themselves? In most cases the answer is quite plain. In Arethusa a new bulb is formed each year. This is also true of Calopogon and Microstylis. In Habenaria a specialized root is formed each year and gives rise to a new plant in the following spring. Pogonia has an extensive system of branching roots, which give off stems at various



intervals. In *P. ophioglossoides* I have found roots six to eight feet long bearing ten to twenty stems upon them, and in *P. verticillata*

roots eighteen to twenty feet long giving rise to five or six separate stems. Here the new shoots arise as "adventitious" buds upon the upper side of the parent roots. The latter are doubtless enabled by this very trait of bud-bearing to continue their growth in length through several years and extend far beyond ordinary limits.

In *Spiranthes cernua* the method of vegetative reproduction is different, as will be seen from the following observations. Some years ago, when looking over in early spring some plants of this species that had been transplanted the year before, I noticed a number of small individuais that looked as if they might be seedlings. But on closer investigation they proved to be young plants of non-sexual growth, arising from the roots of the previous year and in most cases being developed from the tip of the root. At first I thought this might be a case of adaptation to the new conditions of growth in the garden after transplanting, but upon search in the field I found that a large number of cases showed the same phenomena, and I have recently found a similar development in *Neottia* referred to by Strasburger. It seems worth while therefore to call the attention of the readers of Rhodora to this noteworthy method of reproduction in one of our orchids. The accompanying sketch shows the manner of growth of the new plant. The most interesting aspect of the matter is that the tip of the root, which usually possesses a structure peculiar to itself, is here converted, as it appears directly into the growing point of a stem.

Cambridge, Massachusetts.

A NEW JUNCUS OF THE GROUP POIOPHYLLI.

Harley Harris Bartlett.

Juncus monostichus, sp. nov. — Erect, 3–5 dm. tall; culms compressed; leaves basal, from $\frac{1}{2}$–$\frac{3}{4}$ length of culm; blades 0.5–1.5 mm. broad, involute in drying; sheaths loose, mostly free, margins scarious; auricles produced, scarious; inflorescence 4–8 cm. long, much exceeded by its lowest bract, stramineous when mature; branches of inflorescence 1–2.5 cm. long, often incurved, bearing 3–9 conspicuously secund flowers; perianth-segments 4–5 mm. long,

lanceolate, acuminate, with hyaline margins; stamens six, about one-half as long as the perianth; anthers pale yellow, shorter than the filaments; capsule 2 mm. long, trigonous-obovoid, concealed by the closely appressed perianth; placentae not meeting in the axis; stigmas red-brown, reaching almost to tip of perianth; seeds few, ovoid, 0.5 mm. long by 0.2 mm. broad, coarsely reticulate in about 16 rows, areolae longitudinally oblong, 2–2½ times as long as broad.

The type specimens of *Juncus monostichus* were collected south of Anderson, Indiana, by Mr. Charles Piper Smith. He could not refer them to any described species, and very kindly gave me his material for further investigation. It was found to be closely related to *Juncus dichotomus* and *Juncus secundus*, but differed from both in its very small capsules, long basal leaves and large, longitudinally reticulate seeds.

Besides the type material, which has been divided between the Gray Herbarium and the writer's herbarium, there is a sheet in the Gray Herbarium from central Arkansas (F. L. Harvey, no. 9) which is referable to *Juncus monostichus*. The Arkansas plant is mature, but sterile. The capsules of the Indiana plant contain undeveloped ovules, and from one to ten mature seeds. Whether or not this sterile tendency is characteristic of the species, can be determined only by an examination of more material.

The range is, of course, undetermined. Probably a large part of the plants of the Mississippi basin which have been determined as *Juncus secundus* belong to the new species. *Juncus dichotomus* is included in S. Coulter's "Catalogue of the Flowering Plants and Ferns of Indiana," upon the authority of Dr. J. Schneck, whose collections were passed upon by Gray. Dr. Schneck's material should be re-examined, however, as it seems extremely improbable that the range of *Juncus dichotomus* extends as far west as Indiana. The writer will be glad to examine western plants which have been referred to either of the above species.

Gray Herbarium.

NOTES ON NEW ENGLAND HEPATICAE, — III.

Alexander W. Evans.

Since the publication of the second paper of this series[1] additions have been made to the hepatic floras of New Hampshire and Vermont. These additions include three species which are new to New England and which are referred to in the following pages. The other species noted are imperfectly described in the American literature. With the exception of *Cephalozia Sullivantii* and the *Jubula*, the species mentioned are all common to Europe.

1. Marsupella sparsifolia (Lindb.) Dumort. Hep. Eur. 128. 1874. *Sarcoscyphus sparsifolius* Lindb. Not. pro F. et Fl. Fenn. **9**: 280. 1868. *Nardia sparsifolia* Lindb. *l. c.* **13**: 370. 1874. Mt. Washington, New Hampshire (*W. G. Farlow*). This species has been collected by J. Macoun on Vancouver Island, but no other American localities for it have been recorded. Its discovery marks an interesting addition to the hepatic flora of eastern North America. In size, color, and general habit *M. sparsifolia* bears a close resemblance to *M. media*, and the structure of the stem is essentially the same in the two species. The leaves are also very similar, but in *M. sparsifolia* the divisions are usually obtuse instead of rounded, the reverse being the case in *M. media*. The most important differential character, however, is derived from the inflorescence, which is paroicous in *M. sparsifolia* and dioicous in *M. media*. A paroicous inflorescence is also exhibited by *M. ustulata*, but this species may be at once distinguished by its minute size and by the acute divisions of its leaves.

2. Lophozia Kunzeana (Hüben.) Evans, Proc. Wash. Acad. **2**: 305. 1900. *Jungermannia Kunzeana* Hüben. Hep. Germ. 115. 1834. *J. plicata* Hartm. Fl. Scand. Ed. III. **2**: 329. 1838. *J. colpodes* Tayl. Lond. Jour. Bot. **5**: 280. 1846. *J. plicata *Kunzeana* Hartm. Fl. Scand. Ed. X. **2**: 137. 1871. *J. Kunzei β plicata* Lindb. Musc. Scand. 8. 1879. *Sphenolobus Kunzeanus* Steph. Bull. de l'Herb. Boissier, II. **2**: 168. 1902. Mt. Washington, New Hampshire (*W. G. Farlow*). *Lophozia Kunzeana* has a wide distribution in

[1] Rhodora, **6**: 165–174; 185–191. *pl.* 57. 1904.

the alpine and arctic regions of the Northern Hemisphere, although it is rarely abundant in any one locality. In North America it has already been recorded from Greenland, from several widely scattered stations in British America, and from the Adirondack Mountains of New York. It is, however, new to New England. Professor Farlow's specimens represent a gemmiparous and rather slender form of the species.

The leaves of *L. Kunzeana* vary in form from rotund to quadrate; they are subequally bifid and tend to be complicate, although this condition is not always apparent. In rare cases there is a third lobe supplementary to one of the others. The sinus is narrow and extends to the middle or a little less. The divisions are typically rounded at the apex but are often obtusely pointed or, on slender branches, even acute. The leaf-cells have small but distinct trigones, and the cuticle is minutely verruculose or striate. The underleaves vary greatly in size but can usually be demonstrated without much difficulty in spite of the numerous rhizoids. They are either subulate and long-acuminate or else deeply bifid with slender divisions. The gemmae when mature are thick-walled and angular; as a rule they are unicellular but are sometimes divided by a delicate wall into two cells. In exposed localities the stems, leaves and gemmae acquire a characteristic brownish yellow coloration.

The presence of underleaves will at once distinguish *L. Kunzeana* from such species as *Sphenolobus Michauxii*, *Marsupella emarginata* and *Lophozia inflata*, all of which it somewhat resembles in general appearance. Among New England species its closest relative is undoubtedly *L. Floerkii*, which has trifid or quadrifid leaves with a little group of marginal cilia close to the postical base. There is usually no indication whatever of basal cilia in *L. Kunzeana*, although sometimes one or two minute and indistinct teeth may be found in this position.[1] Its relationship to *L. Floerkii* and to other members of the *barbatae*-group is clearly shown by the occasional presence of a third lobe and by the constant occurrence of underleaves, and it would seem as if these characters were sufficient to exclude it from the genus *Sphenolobus*, where it is placed by Stephani.

3. Chiloscyphus pallescens (Ehrh.) Dumort. Syll. Jung. 67. 1831. *Jungermannia viticulosa* L. *p. p.* Sp. Plant. 1597. 1753. *J.*

[1] See Schiffner, Lotos, **49**: 51. 1901.

pallescens Ehrh. Crypt. Exsic. *502*; Hoffmann, Deutschlands Flora, **2**: 87. 1795. *J. polyanthos β pallescens* Lindenb. Nova Acta Acad. Caes. Leop.-Carol. **14**, suppl.: 30. 1829. *Chiloscyphus lophocoleoides* Nees, Naturgeschichte der europ. Lebermoose, **2**: 365. 1836. *J. ascendens* Hook. & Wils.; Drummond, Musc. Amer. St. Merid. *165*. 1841. *C. labiatus* Tayl. Lond. Jour. Bot. **5**: 284. 1846. *C. ascendens* Sulliv. Gray's Manual, Ed. I. 691. 1848; Ed. II. 691. *pl.* 7. 1856. *C. polyanthos β pallescens* Hartm. Fl. Scand. Ed. X. **2**: 145. 1871. *C. polyanthos β viticulosus* Lindb. Not. pro. F. et Fl. Fenn. **13**: 354. 1874. *C. viticulosus* Lindb. Acta Soc. Sc. Fenn. **10**: 505. 1875. On rotten logs, rarely on shaded banks rich in humus. Mountains of New England (*W. Oakes*). Jackson, New Hampshire (*A. W. E.*). Connecticut: Bethany (*D. C. Eaton*); Oxford (*E. B. Harger*); Woodbridge and Salisbury (*A. W. E.*). Although *C. pallescens* has long been recognized by European botanists, it has usually been regarded as a variety of the common and widely distributed *C. polyanthus*. The most reliable characters separating the two species are drawn from the leaf-cells and from the perianth. In *C. polyanthus* the cells are usually less than 30 μ in diameter, and the lobes of the perianth are entire or nearly so; in *C. pallescens* the cells measure 35–40 μ or even more, and the lobes of the perianth are more or less dentate or lacerate. *C. polyanthus*, moreover, grows in very wet localities, sometimes on the earth or mixed with mosses in swamps, sometimes affixed to stones in running water, sometimes floating in shaded pools. Both species are autoicous in their inflorescence.

According to the published descriptions *C. ascendens* and *C. pallescens* are very closely related species, but differ from each other in their underleaves, those of *C. ascendens* being quadrifid while those of the other species are only bifid. This difference, however, is most inconstant. The underleaves of *C. ascendens*, as a matter of fact, are deeply bifid, just as in *C. pallescens*, the divisions being long and slender and tapering out into hair-like points. Sometimes these divisions are entire; sometimes one or both of them will show a short tooth, rarely more than three cells long, close to the base. These teeth give a trifid or quadrifid appearance to the underleaves; but, as similar teeth may also be found in European material of *C. pallescens*, they cannot yield differential characters of importance. It seems necessary, therefore, to consider *C. ascendens* a simple synonym of *C. pallescens*.

As the synonymy shows Lindberg took up for *C. pallescens* the old Linnaean name *viticulosus*. *Jungermannia viticulosa* L., however, was an aggregate and was based on two figures, the one by Micheli[1] and the other by Dillen.[2] Micheli's figure is quoted first and ought therefore to be considered as representing the type of the species. This figure shows a widely distributed European plant, now universally known as *Saccogyna viticulosa* (L.) Dumort. Dillen's figure, on the other hand, represents *C. pallescens*.[3] In order, however, to supplant Ehrhart's specific name *pallescens* by the older name of Linnaeus, it would be necessary to recognize two distinct Linnaean species, both bearing the name *J. viticulosa*, a proceeding which could hardly be recommended.

4. CEPHALOZIA MYRIANTHA Lindb. Medd. Soc. F. et Fl. Fenn. **1**: 110. 1876. *C. Jackii* Limpr.; Spruce, On Cephalozia, 67. 1882. Amesbury, Massachusetts (*J. W. Huntington*). It has lately been shown by Schiffner[4] that the characters which were supposed to separate *C. Jackii* from *C. myriantha* are inconstant and of minor importance. He therefore considers them synonyms and takes up for the species Lindberg's name, which is several years older than Limpricht's. A change to this effect should accordingly be made in the writer's Preliminary List of New England Hepaticae.[5]

5. CEPHALOZIA SULLIVANTII Aust. Hep. Bor.-Amer. *50*. 1873. *Jungermannia Sullivantii* Aust. Proc. Acad. Philadelphia for 1869: 221. Chocorua, New Hampshire (*W. G. Farlow*). This rare species is new to New England; it has been previously reported from Ontario, Ohio and New Jersey. It is an exceedingly minute plant, smaller even than *C. divaricata*, and has always been found on rotten logs. In all probability it has been overlooked on account of its inconspicuousness. It agrees with *C. divaricata* in its dioicous inflorescence but differs in its relatively more fleshy stem and in its much smaller leaves. Professor Farlow's specimens are all male and show dentate perigonial bracts.

6. **Jubula pennsylvanica** (Steph.) comb. nov. *Frullania Hutchinsiae* and *Jubula Hutchinsiae* Auct. (in part), not *Jungermannia*

[1] Nov. Plant. Gen. *pl. 5, f. 4.* 1729.
[2] Hist. Musc. *pl. 69, f. 7.* 1741.
[3] See Lindberg, Hepat. Utveckl. 28, 33. 1877.
[4] Oesterr. Bot. Zeitschr. **54**: 251. 1904.
[5] RHODORA, **5**: 170–173. 1903.

Hutchinsiae Hook. (=*Jubula Hutchinsiae* Dumort.). *Frullania Hutchinsiae* var. β G. L. & N. *p. p.* Syn. Hep. 775. 1847. *F. Hutchinsiae* var. β *integrifolia* Lindb. *p. p.* Acta Soc. Sci. Fenn. **10**: 474. 1875. *F. pennsylvanica* Steph. Hedwigia, **22**: 147. 1883. *F. Hutchinsiae* var. Underw. Bull. Illinois State Lab. Nat. Hist. **2**: 65. 1884. *Jubula Hutchinsiae* var. *Sullivantii* Spruce, Hep. Amaz. et And. 62. 1884. Maine: Mt. Desert (*E. L. Rand*). New Hampshire: Chocorua (*W. G. Farlow*); Jackson (*A. W. E.*). Vermont: Brattleboro (*C. C. Frost*). Connecticut: Hamden (*D. C. Eaton*); Cheshire, Beacon Falls, Woodbridge, Salisbury,[1] Middletown and Rainbow (*A. W. E.*). The known range of the plant extends from Nova Scotia to Georgia and westward to Tennessee.

Jubula Hutchinsiae is regarded by the majority of writers on the hepaticae as a variable species with a very wide geographical distribution. The type specimens were collected by Miss Hutchins, at Bantry, Ireland, about a hundred years ago, and the typical form of the species is now known in Europe from scattered stations in the British Isles and from a very few localities in western France. Throughout its entire range it is rare or extremely local. The *Jubula* noted above has usually been referred to *J. Hutchinsiae* as a variety, although its very aberrant characters have long been recognized. Other divergent forms are known from Madeira, from tropical America, from Japan and the East Indies and from various islands of the Pacific. A *Jubula* from the Hawaiian Islands has already been separated as *J. piligera* (Aust.) Evans,[2] *J. japonica* Steph. has recently been described from Japan,[3] and it is probable that other species of the genus will in time be considered distinct.

In the true *J. Hutchinsiae* the leaves are characterized by their spinose-dentate margins, the teeth varying in number from two to twelve but averaging five or six. Most of these teeth are from four to six cells long and two or three cells wide at the base, and the apical tooth is usually a little larger than the others. The lobule is helmet-shaped and inflated, with a broad and truncate mouth, and, at the outer basal angle, is often extended in the form of a

[1] These specimens were collected in Sage's Ravine, very close to the Massachusetts line. In the writer's Preliminary List, they are accredited to Massachusetts; this record should therefore be revised.

[2] Trans. Conn. Acad. **10**: 406. *pl. 47, f. 12–20.* 1900.

[3] Bull. de l'Herb. Boissier, I. **5**: 92. 1897.

slender hair-like spur, about four cells long and one or two cells wide at the base. According to Gottsche[1] this spur represents the true apex of the lobule. If the conditions for growth are unfavorable the lobule often fails to develop a water-sac and then consists of a small pointed lamina, which is sometimes so reduced as to be scarcely apparent. The underleaves are bifid, with slender acuminate divisions, and are either entire on the margins or bear one or two lateral hair-like teeth.

In *J. pennsylvanica* the leaves vary from rounded or obtuse at the apex to apiculate, the apical tooth being rarely more than two or three cells long; the margin is otherwise entire. The lobule is invariably without a spur and is often slightly narrowed at the mouth. The divisions of the underleaves are sometimes blunt but are usually acuminate, and the margins, in rare instances, are angular-dentate on the sides; as a rule, however, the margins are quite entire.

The differences noted in the leaves also appear in the bracts, although possibly in a less degree. In both species the bracts are deeply and subequally bifid. In *J. Hutchinsiae* the lobe is ovate and long-acuminate, and there are several spine-like teeth on the margin; the lobule is also acuminate but is commonly entire. In *J. pennsylvanica* both lobe and lobule are broader than in the other species and are abruptly apiculate or acuminate at the apex; the margins are entire. The bracteoles in both species are deeply bifid with acuminate divisions, but those of *J. Hutchinsiae* taper more gradually and usually bear a few spinose teeth on the margin, instead of being entire.

Lindberg's variety *integrifolia*, based primarily on Irish specimens, is not wholly destitute of teeth. It seems to be little more than an attenuate and poorly developed form of *J. Hutchinsiae*, and is so regarded by Pearson and other European writers. The specimens figured by Moore[2] are practically without lobules and present a very different appearance from robust and well-developed forms of *J. pennsylvanica*.

In the opinion of the writer *J. pennsylvanica* represents a distinct species with a definite geographical distribution. The entire leaves and the lobules without spurs afford reliable differential characters.

[1] G. & R. Hep. Europ. *477* (note).

[2] Proc. Roy. Irish Acad. II. **2** : *pl. 45*. 1877.

It grows on shaded rocks in very moist localities and prefers situations where it may be thoroughly soaked by dripping water.

Aside from the species noted in the preceding pages the following additions have been made to the flora of New Hampshire: *Asterella tenella* and *Reboulia hemisphaerica*; Cornish (*Miss Haynes*). *Riccardia palmata* and *Cephalozia fluitans*; Chocorua (*W. G. Farlow*). *Cololejeunea Biddlecomiae*; Cornish (*Miss Haynes*) and Hanover (*A. LeR. Andrews*). *Frullania Brittoniae* and *Lophocolea minor*; Cornish (*Miss Haynes*). *Mylia anomala*; Chocorua (*W. G. Farlow*). *Anthoceros punctatus* and *Notothylas orbicularis*; Cornish (*Miss Haynes*).

The additions for Vermont are the following: *Fossombronia Wondraczeki*; Newfane (*A. J. Grout*). *Pallavicinia Lyellii*; Willoughby (*Miss Lorenz*). *Nardia obovata*; Manchester (*A. J. Grout*).

In the Preliminary List of New England Hepaticae several records are marked with the sign "—", showing that they were known to the writer from printed reports only. It is perhaps worthy of note that, in the following cases, the sign "—" may now be replaced by the sign "+". For Vermont: *Riccia fluitans*, *Asterella tenella*, *Riccardia multifida*, *Chiloscyphus polyanthus*, *Lophozia incisa*, *Nardia crenulata*, *Anthoceros laevis* and *A. punctatus*. For Massachusetts: *Harpanthus scutatus*, *Lophocolea bidentata* and *Sphenolobus exsectus*. For Rhode Island: *Cephalozia connivens* and *Trichocolea tomentella*.

The Rhode Island records, on the other hand, for *Lophozia barbata*, *Porella pinnata* and *Anthoceros punctatus* seem to have been based on incorrect determinations. Although it is hardly probable that these species are actually absent from the Rhode Island flora, they ought to be omitted for the present from lists of Rhode Island plants. The Massachusetts records, also, for *Lophozia gracilis* and *Sphenolobus Michauxii*, as well as for *Jubula pennsylvanica* (see page 56, footnote), were based on specimens collected in Sage's Ravine, Salisbury, Connecticut. They ought therefore to be accredited to the latter state.

With these additions and subtractions the census of New England Hepaticae now stands as follows: Total number recorded, 131; number recorded from Maine, 79; from New Hampshire, 99; from Vermont, 81; from Massachusetts, 80; from Rhode Island, 62; from Connecticut, 96; from all six states, 36.

Yale University.

Meeting of the Vermont Botanical Club. — The tenth annual winter meeting of the Vermont Botanical Club was held at Burlington, January 18–19, 1905. President Ezra Brainerd of Middlebury College presided and the following papers were read: — A Report of the Last Field Meeting, Mrs. Mary A. Munson; The Fossil Fruits of the Brandon Lignite, Prof. G. H. Perkins; Notes on the Fruiting Season of the Moss, Catherinia, Miss Phebe M. Towle; Nitrogen-fixation by Leguminous Plants, L. P. Sprague; The Story of a Maple Tree, J. A. Chapin; Another Giant Puff-ball from Middlebury, Mrs. Sarah K. Lord; Hunting Pines in Mexico, C. G. Pringle; The Aquarium in the School and the Home, H. F. Perkins; Reminiscences of Europe, Prof. L. R. Jones; Prof. Henry G. Jesup, the Botanist and the Man, Dr. C. H. Richardson; On a Botrychium new to Massachusetts, Mrs. E. B. Davenport; The Conception of Species as indicated by the Study of the Genus Viola, President Ezra Brainerd; Breeding Plants for Disease Resistance, W. A. Orton; Experiments in Plant Breeding, Prof. William Stuart; Studies of the Potato Fungus, W. M. Gambell; An Experience with one of the Fungi producing Dry-rot in Timber, Mrs. Nellie F. Flynn; Agriculture for Normal Students, Miss Ruth B. Fisher; Pursh's Journal, W. W. Eggleston; Blackberries and Raspberries, W. H. Blanchard; Ferns of Dorset, Allan Bourn; Additional Species of Vermont Mosses, A. J. Grout; Notes on Some Plants from Matinicus Island, Me., J. A. Bates.

On the evening of the 18th supper was served in the gymnasium of the University of Vermont, complimentary to the non-resident members of the club. This social gathering, which was one of the most pleasing features of the meeting, was followed by the annual roll-call and business meeting. Each member, according to the custom of the club, presented some item of botanical interest in responding to his name. The old officers were re-elected. The treasurer's office was made independent of that of the secretary and Mrs. Nellie F. Flynn was elected to fill the former position. Prof. J. W. Votey, Mrs. Sarah K. Lord, and Mr. Carleton D. Howe were appointed to serve with the officers as members of the new Executive Committee. The officers were instructed to petition the Post Office Department to re-establish the office at Willoughby Lake. The post office at this well known station of botanical interest, after sixteen years' existence, was discontinued about a year ago. For the summer meeting of the Club a boat will probably be chartered for a cruise among the islands and along the shores of Lake Champlain. — W. J. Morse, Burlington, Vermont.

A well marked Species of Sparganium.— Among the Bur-reeds of New England there is none which can be more readily recognized than a plant which grows in deep water of cold lakes. Its salient features are a branched inflorescence, sessile heads, short oblique stigma, and firm-coated oblong-fusiform fruit ending in a stouitsh rather rigid falcate beak. Most of our other bur-reeds show a preference for shallower or warmer water, wet sandy shores, etc., and none of them shares the traits of or show any intergradation with this well marked species, which may be characterized as follows:

Sparganium fluctuans, n. comb. *S. simplex*, var. *fluitans*, [Engelm. in] Gray, Man. ed 5, 481 (1867), not *S. fluitans*, Fries. *S. androcladum*, var. *fluctuans*, Morong, Bull. Torr. Bot. Club, xv. 78 (1888); Britt. & Br. Ill. Fl. i. 64 (1896). Gracile vel mediocriter robustum, 2.6–15 dm. longum; basi erecta alte immersa, parte superiori foliorum natante; radice e fibris numerosis flavo-brunneis composita; foliis linearibus leviter carinatis 3–11 mm. latis, basalibus perlongis, caulinibus gradatim brevioribus, bractealibus 3–12 cm. longis basi paululum saccato-ampliatis; inflorescentia ramosa, ramis saepissime 3 capita arcte sessilia 1–2 inferiora ♀ 2–4 superiora ♂ gerentibus; capitibus ♀ ad maturitatem 2 cm. diametro; stylo unico leviter curvato, stigmate obliquo ovale vel brevissime oblongo; fructu fusiforme vel media parte subcylindrico vel etiam subconstricto, apice in rostrum firmiusculum falcato-gladiatum persistentem attenuato, exocarpo firmo laevi vel obscure striatulo.— Cold lakes and ponds, Western Central Maine to southern Quebec, Connecticut, and Minnesota. Specimens examined:— Quebec: L. Memphremagog, 1 Aug. 1903, *Churchill.* Maine: Cambridge, *Bunker*; Sweet's Pond, New Vineyard, 15 Aug. 1894, *Fernald*; Pease Pond, Wilton, 11 Aug. 1894, *Fernald*; Hartford. July, 1886, *Parlin*; E. Auburn, *Merrill*, no. 381. New Hampshire: Ponds at base of White Mts. *Oakes.* Vermont: Chittenden Pond, 18 Aug. 1895, *Eggleston*; L. Dunmore, 11 Aug. 1896, *Brainerd*; Wallingford, 4 Sep. 1898. Eggleston. Connecticut: Nettleton's Pond, Norfolk, Sep. 1864, *Robbins.* L. Superior: *Beardslee.* Minnesota: Vermilion Lake, *Arthur*, *Bailey*, & *Holway*, No. B. 83.— B. L. Robinson, Gray Herbarium.

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DRABA INCANA AND ITS ALLIES IN NORTHEASTERN AMERICA.

M. L. Fernald and C. H. Knowlton.

(Plate 60.)

Recent collections of the *Draba incana* group, especially those from the Gaspé Peninsula in Quebec, have shown clearly that former treatments have not fully covered the eastern North American material, which has heretofore been mostly referred to *D. incana*, L., and *D. arabisans*, Michx. A careful study of *D. incana*, as interpreted by Koch [1] and other European authors, shows that this plant is not represented in the eastern United States. True *D. incana* is clearly marked by the margins of the basal leaves, which are hirsute-ciliate with long simple hairs. It is mostly a simple, very leafy plant, with few basal rosettes, densely pilose-hirsute leaves, and sessile or subsessile stigmas. This is the common plant of northern Europe, Iceland and Greenland. On this continent it is found in Labrador, Newfoundland, eastern Quebec (Percé), and one specimen has been seen from Bathurst, New Brunswick. It is therefore apparently confined to the northeastern coast, and is scarcely to be expected inland or southward. A form with pubescent siliques seems to have the same range both here and in Europe, and is referred to var. *confusa* of Poiret. This is the var. *hebecarpa* of Lindblom and the *D. confusa* of Ehrhart, as Lindblom has clearly shown.[2]

D. arabisans of Michaux is a very distinct American species of definite range. It is a tall, rather slender, branching plant, with

[1] Koch, Syn. ed. 2, i. 70 (1843). [2] Lindblom, Linnaea, xiii, 332 (1839).

matted rosettes at the base, thin, slightly pubescent green leaves, and smooth, narrow, much twisted siliques, terminated by a very distinct style. This is the familiar smooth-podded plant of northern Vermont and northern New York. Its range is the St. Lawrence valley, from the Great Lakes to the Gulf, with occasional stations in Vermont and central Maine. *D. glabella*, Pursh, from Hudson Bay, is referred to this species by Torrey and others. Material of this has not been seen, nor has any from the Hudson Bay region been accessible, so it cannot be stated definitely what the name stands for. It is referred tentatively to the first variety described below. Another plant mentioned by Torrey & Gray,[1] as *D. arabisans β* (*D. Longii*, Schwein. in herb.) from Lake Superior, is somewhat obscure, but apparently is merely a short-styled extreme. The first variety of *D. arabisans* described below is a constant form occurring frequently in Labrador, the Gaspé Peninsula, and adjacent Quebec and northern New Brunswick. It is clearly marked by smaller size and shorter, not twisted siliques. To this species, *D. arabisans*, also is referred the local *D. canadensis*, Brunet, a plant with very short ovate siliques, known from a single station only on the northern shore of the lower St. Lawrence.

The American plant with pubescent siliques which has passed for *D. incana* in Gray's Manual and other works, is a species of wide distribution, for it is found in northern Asia, alpine Europe, and at different stations in eastern North America as well as in the Rocky Mountains. It has been called by various names, but as Koch plainly demonstrates,[2] it is properly the *D. stylaris* of Gay, not *D. confusa* of Ehrhart, to which it is often referred. This plant is clearly separated from *D. incana* by the canescent pannose-stellate pubescence of the leaves, which entirely lack the longer simple hairs of that species. It is much less leafy, and the silique is tipped by a distinct style. Schlechtendal has described a Labrador plant as *D. Henneana*, which seems from his description to be identical with *D. stylaris*.

A peculiar plant was collected in 1902 by E. F. Williams and M. L. Fernald at Paspébiac, Quebec, where it covered an extensive gravelly beach. It is coarse and scabrous, with elliptic siliques and very large seeds, 1.33 to 1.5 mm. long. The plant is strikingly

[1] Fl. N. Am. i. 106 (1838). [2] Koch, Syn. ed. 2, i. 70 (1843).

different from other eastern members of the group but it seems to be a very close relative of *D. borealis* of the Behring Sea region. From that northwestern species it differs in several clear characters and it is here given specific rank.

On the exposed limestone cliffs about Percé, at the tip of the Gaspé Peninsula, is a species with cuneate basal leaves, and a very peculiar short oblong silique. This is crowded with seeds, which overlap so closely as to produce angulate edges. The funiculus is very short, while in the other species here discussed it is half as long as the seed. This plant is so clearly marked that it also seems justly entitled to specific rank.

There are numerous references to *Draba incana* throughout American literature, but it has been impossible clearly to identify many of them. In the present treatment are cited only specimens actually seen; and the species are illustrated by detailed figures prepared by Mr. F. Schuyler Mathews.

* Margins of basal leaves hirsute-ciliate with long simple hairs.

D. INCANA, L. (Figs. 1, 2.) Biennial, or perennial by scattered offshoots, caudex sub-simple: flowering stems usually single, occasionally 2 to 5, very leafy, 0.4–4 dm. high, densely pilose-hirsute: basal rosettes few; their leaves oblanceolate, subentire to sparsely sharp-dentate, 0.5–2.5 cm. long, green, loosely pubescent with simple and more or less stellate hairs; cauline leaves lanceolate to narrowly ovate, dentate, 0.5–2 cm. long, pubescence as in basal leaves: racemes comparatively dense; pedicels pilose-hirsute, in fruit mostly becoming 1.5–3 mm. long (lowest rarely 1 cm. long): siliques appressed-ascending, oblong, flat or slightly contorted, acutish, 7–10 mm. long, 2–3.5 mm. broad; stigmas sessile or sub-sessile; valves glabrous: seeds not crowded, 0.9–1.4, average 1.08 mm. long.— Sp. 643, in part (1753); Reich., Ic. Crit. viii. t. 769 (1830); Reich., Ic. Fl. Germ. ii. t. 14, fig. 4249 (1837); Hook., Trans. Linn. Soc. xxiii. 317 (1861); Watson in Gray, Syn. Fl. i, pt. 1. 111, in part (1895). *D. contorta*, Ehrh., Beitr. vii. 155 (1792); DC., Syst. ii. 348 (1821). *D. incana*, α, Hook., Fl. Bor.-Am. i. 55 (1830); Torr. & Gray, Fl., 107 (1838). *D. incana*, α *legitima*, Lindblom, Linnaea, xiii. 331 (1839); Koch, Syn. Ed. 2, i. 70 (1843). *D. incana*, γ *diffusa*, Lindblom, l. c. (1839).— Northern Europe, Iceland and Greenland: LABRADOR, Rigoulette, Aug. 25, 1891 (*Bowdoin Coll. Ex.*, no. 269);

July 13, 1892 (*J. D. Sornborger*, no. 70): Newfoundland, cliffs, Notre Dame Bay, July 2, 1894 (*A. C. Waghorne*); Barred Islands, August 12, 1903 (*J. D. Sornborger*): Quebec, crests of calcareous sea cliffs, Cap Blanc, Percé, Aug. 17, 1904 (*Collins, Fernald & Pease*): New Brunswick, near Bathurst, July, 1881 (*C. Lindon*).

Var. confusa, Poir. Siliques pubescent.— Suppl. ii. 524 (1811). *D. incana*, L., Sp. 643, in part (1753). *D. confusa*, Ehrh., Beitr. vii. 155 (1792); DC., Syst. ii. 348, in part (1821). *D. incana, β confusa*, Torr. & Gray, Fl. 107 (1838). *D. incana*, var. *hebecarpa*, Lindbl., Linnaea xiii. 331 (1839); Koch, Syn. Ed. 2, i. 70 (1843).— General range of the species, but occurring in separate colonies: Labrador, Okkak (*Fratres Moravi*); on a roof, Fox Harbor, Aug. 13, 1882 (*J. A. Allen*, No. 76): Quebec, shore, Salt Lake, Anticosti, Aug. 11, 1883 (*J. Macoun*, No. 19); limestone detritus, crest of Cap Barré, Percé, Aug. 16, 1904 (*Collins, Fernald & Pease*).

* * Basal leaves uniformly stellate-pubescent, not ciliate above the petiolar base.

+ Siliques pubescent, at least when young.

++ Mature seeds 0.70–0.95 mm. long.

D. stylaris, Gay. (Figs. 3–5.) Biennial or perennial, with simple or slightly branching caudex: flowering stems 1 to 6, simple or slightly branching, pilose, 1–3.5 dm. high, remotely leafy: basal rosettes few; their leaves crowded, oblanceolate, remotely dentate, 1–4 cm. long, canescent with soft stellate tomentum; cauline leaves 3–10, ovate to oblong, usually dentate, 0.5–3 cm. long, their pubescence scantier than in the basal leaves: racemes loose; pedicels sub-ascending, in fruit becoming 2–5 mm. long: siliques narrowly oblong to lanceolate, frequently twisted, acutish, 7–12 mm. long, 1.25–2.25 mm. wide; stigmas usually definite; valves stellate-canescent: seeds not crowded.— Gay in Thomas, Cat. (1818) fide Koch Syn. Ed. 2, i. 70 (1843). *D. confusa* Reich., Ic. Crit. viii. 1033 (1830), and Ic. Fl. Germ. ii. t. 14, fig. 4248 (1837), and various European authors; not Ehrhart. *D. Henneana*, Schlecht., Linnaea, x. 100 (1836). *D. Thomasii*, Koch, Syn. Ed. 2, i. 438 (1843). *D. incana*, Gray, Man. Ed. 5, 71 (1867); Watson in Gray, Syn. Fl. i. part 1, 111, in part (1895); not L. — Northern Asia, alpine Europe, Greenland: Labrador, Ramah, Aug. 15, 1892 (*J. D. Sornborger*, no. 214): Newfoundland, high sea cliffs, Chimney Cove, 1896 (*A. C.*

Waghorne): New Brunswick, dry rocks, Nashwaak, 1881 (*J. Moser*, Herb. N. B. Nat. Hist. Soc.): Vermont, dry cliffs, Willoughby Mt. (*Tuckerman*, *H. Mann*, *et al.*); dry cliffs, Smuggler's Notch, Mt. Mansfield, Aug. 2, 1893 (*W. W. Eggleston*): Colorado, South Park, 1873 (*Wolf & Rothrock*, no. 631): Alberta, Bow River Pass, Sept. 13, 1879 (*J. Macoun*): British Columbia, Macleod's Lake, Lat. 55°, June 21, 1875 (*J. Macoun*, no. 157).

++ Mature seeds 1.33–1.5 mm. long.

D. megasperma, n. sp. (Figs. 6–8). Perennial; caudex stout and branching: flowering stems 2 to 25, 1–3 dm. high, simple or loosely branched, scabrous-puberulent with stellate hairs, remotely leafy: basal rosettes numerous; their leaves spatulate, harsh with canescent-stellate hairs, entire or rarely dentate, 1–3 cm. long; cauline leaves, 3 to 10, oblong-ovate, sub-entire, 1–1.5 cm. long, sparingly stellate: racemes loose; pedicels sub-ascending, in fruit becoming 1.5–5 mm. long, glabrate: siliques elliptic, flat or barely twisted, 5–11 mm. long, 3–4 mm. broad, sparingly harsh-stellate, finally glabrate; stigmas sub-sessile: seeds not crowded. — Quebec, gravelly beach, Paspébiac Lighthouse, Bonaventure County, July 26, 1902 (*Williams & Fernald*).

Superficially resembling *D. borealis*, DC., of the Behring Sea region, a plant with longer looser pubescence, more elongate fruiting pedicels, and thinner less canescent leaves.

+ + Siliques glabrous from the first.
++ Seeds not crowded, their edges rounded.

D. arabisans, Michx. (Fig. 9.) Perennial; caudex branching: flowering stems 1 to 40, simple or loosely branched, 1.5–4.5 dm. high, sparingly pubescent: basal rosettes numerous; their leaves oblanceolate or spatulate, entire or somewhat dentate, thin, green, thinly stellate-pubescent, 1–7 cm. long; cauline leaves 4–13, oblanceolate, serrate-dentate, 1–4.5 cm. long, otherwise like the basal: racemes loose; pedicels divergent, in fruit becoming 4–10 mm. long: siliques elliptic-lanceolate, much twisted, 9–15 mm. long, 1.5–3 mm. wide; style definite: seeds 1–1.5 mm. long. — Fl. Bor.-Am. ii. 28 (1803); DC., Syst. ii. 349 (1821) and Prodr. i. 170 (1824); Torr. & Gray, Fl. N. Am. i. 106 (1838); Torr., Fl. N. Y. i. 62 (1843); Gray, Gen. i. 160, t. 68 (1848) and Man. 39, (1848).

D. Arabis, Pers., Syn. ii. 190 (1807). *D. glabella*, Pursh, Fl. 434 (1814) fide Torr. & Gray, Fl. N. Am. i. 668, and Watson, Bib. Ind. 58 (1878). *D. incana*, var. *arabisans*, Watson, Proc. Am. Acad. xxiii. 260 (1888), in Gray, Man. ed. 6, 67 (1890), and in Gray, Syn. Fl. i. part 1, 111 (1895); Britton & Brown, Ill. Fl. ii. 142 (1897). *D. incana*, var. *glabriuscula*, Gray, Ann. Lyc. Nat. Hist. N. Y. iii. 223 (1835).—An American species described by Michaux from "rupibus ripariis ad lacum *Champlain* et in Nova Anglia." — Newfoundland, sea cliffs, Bay of Islands, June 24, 1895 (*A. C. Waghorne*): Quebec, calcareous cliffs, Mt. Ste. Anne, Percé, Aug. 18, 1904 (*Collins, Fernald & Pease*); rocky bank of the Grand River, Gaspé Co., July, 1903 (*G. H. Richards*), July 2, 1904 (*Fernald*); trap cliffs at 1800–1900 feet, Tracadigash Mt., Carleton, July 24, 1904 (*Collins, Fernald & Pease*); limestone-conglomerate cliffs, Bic, Rimouski Co., July 16–18, 1904 (*Collins & Fernald*); Maine, Mt. Kineo, Sept., 1887 (*G. G. Kennedy*); Day Mt., Franklin Co., July 24, 1903 (*C. H. Knowlton*), Aug. 31, 1904 (*C. H. Knowlton & E. B. Chamberlain*): Vermont, Lake Champlain (*Michaux* in Herb. Mus. d'Hist. Nat., Paris); rocky shores and cliffs, Gardner Island, Lake Champlain (*Faxon, et al.*); cliffs of Willoughby Mt. (*Wm. Boott, et al.*); Smuggler's Notch, Mt. Mansfield (*Faxon, et al.*); Snake Mt., Weybridge, June 30, 1892 (*W. W. Eggleston*) Mt. Eolus, Dorset, September, 1901 (*Mrs. E. H. Terry*): New York, rocky banks of lakes in St. Lawrence and Jefferson Counties (*A. Gray*); Sacketts Harbor (*W. A. Wood*); Cayuga Lake, June 16, 1885 (*W. R. Dudley*); near Akron, Erie County, 1864 (*G. W. Clinton*): Ontario, from Sault Ste. Marie to Michipicoten Bay (*C. G. Loring*).

Var. **orthocarpa**, n. var. (Figs. 10, 11.) Generally lower, 1–3 dm. high: siliques rarely twisted, 5–10 mm. long, 2–4 mm. wide: seeds 0.8–1.25 mm. long.— Labrador, without station (*Martin*); Hopedale (*J. Steetz*); base of cliff, Dead Islands, Aug. 20, 1882 (*J. A. Allen*, no. 25): Quebec, on shingle, West Point, Anticosti, Sept. 7, 1883 (*J. Macoun*, no. 20); cold cliffs, Grand Coupe, Percé, Aug. 19, 1904; cliffs of Gaspé Bay, Douglastown, Aug. 22, 1904; shaded calcareous cliffs, Little River, Gaspé County, Aug. 16, 1904; trap cliffs at 1800–1900 ft., Tracadigash Mt., Carleton, July 24, 1904 (*Collins, Fernald & Pease*); limestone-conglomerate cliffs, Bic, Rimouski County (type) July 15–18, 1904 (*Collins & Fernald*): New Brunswick, Restigouche River, July 28, 1888 (*J. Brittain*); rocks, Kennebec-

asis Island, June 12, 1886 (*J. E. Wetmore*): VERMONT, Willoughby Mt., July 28, 1885 (*W. Deane*). — This is *Arabis petraea* of Fowler's List of Plants of New Brunswick (Nat. Hist. Soc. N. B. Bull. no. 4, 15, 1885), and it is possibly *D. glabella*, Pursh, referred to *D. arabisans* by Torrey & Gray, and others. One individual from Tracadigash Mt. has the siliques acutely triquetrous, with three valves and two false partitions.

Var. **canadensis**, n. comb. (Fig. 12.) Low, 1–1.5 dm. high: siliques elliptic-ovate, 5–7 mm. long, 3–4 mm. broad. *D. canadensis*, Brunet, Cat. Plantes Can. 21 (1865).— QUEBEC, crevices of rocks, St. Joachim, Cap Tourmente, 1864 (*Ovide Brunet*).

++ ++ Seeds closely crowded, angulate.

D. pycnosperma, n. sp. (Figs. 13–15.) Perennial; caudex freely branching: flowering stems, 1 to 30, mostly simple, 0.5–2.5 dm. high, loosely pilose: basal rosettes very numerous, their leaves cuneate-spatulate, sparingly dentate above the middle, 0.7–3 cm. long, closely stellate-pubescent; cauline leaves 2 to 4, oblong, 0.5–1.5 cm. long: racemes short and loose, in maturity 1.5–8 cm. long; pedicels slightly spreading, 2–6 mm. long, glabrate: siliques plump, compressed, oblong to short-ovoid, 2.5–6 mm. long, 1.5–2.5 mm. broad; style very short but definite: funiculus very short: seeds, 0.9–1.2 mm. long, closely crowded and overlapping, angulate.— QUEBEC, Percé, crests of calcareous sea cliffs, Cap Blanc, Aug. 17, 1904; Cap Barré, Aug. 16, 1904; limestone ledges, Le Coulé, Aug. 17, 1904 (*Collins, Fernald & Pease*).

GRAY HERBARIUM.

EXPLANATION OF PLATE 60. — *Draba incana*; fig. 1, small plant, life-size; fig. 2, silique, with valve removed, × 4. *D. stylaris*; fig. 3, portion of base, life-size; fig. 4, tip of fruiting raceme, life-size; fig. 5, silique, with valve removed, × 4. *D. megasperma*; fig. 6, portion of base, life-size; fig. 7, tip of fruiting raceme, life-size; fig. 8, silique, with valve removed, × 4. *D. arabisans*; fig. 9, portion of fruiting raceme, life-size. *D. arabisans*, var. *orthocarpa*; fig. 10, tip of fruiting raceme, life-size; fig. 11, silique, with valve removed, × 4. *D. arabisans*, var. *canadensis*; fig. 12, fruiting raceme, life-size. *D. pycnosperma*; fig. 13, portion of base, life-size; fig. 14, fruiting raceme, life-size; fig. 15, silique, with valve removed, × 4.

SOME PLANTS RARE OR HITHERTO UNRECORDED IN CONNECTICUT.

R. W. Woodward.

Lespedeza repens, Bart. This plant occurs at a station in the rear of West Rock and near Lake Wintergreen, about two miles from New Haven. I collected it here August 22, 1903, and again in 1904. It covers a surface about one rod square, in a slight thicket on a steep rocky slope, and appears to be well established. The Illustrated Flora gives Long Island as the northern limit of this species, and it has not, so far as I am aware, been previously reported from Connecticut.

Solidago bicolor, L. var. *concolor*, Torr. & Gray. I collected this variety Sept. 24, 1904, at Franklin on a slightly shaded bank by a country road. The white-flowered species was abundant here, but a few plants were found whose rays were of a bright yellow color. A mowing machine had just been run over the bank for the annual autumnal "cleaning up," and these plants were found on a narrow strip which had not been cut. The indications were that a visit a day earlier would have yielded many more of them. This variety is said to be quite rare in Connecticut.

Eatonia Dudleyi, Vasey. This species, which Dr. C. B. Graves reported from New London County several years ago (Rhodora, I. 68), occurs at many places about New Haven, in dry, open woods, growing with *E. Pennsylvanica*, Gray. It is sometimes more frequent than the latter species, and is readily distinguished from it in the field by its shorter leaves and more slender panicle. A good station is along the paths up the front slope of West Rock, where it is abundant in June. I have also collected this species at the base of Meriden Mountain, eighteen miles north of New Haven.

Panicum autumnale, Bosc. I found several specimens of this western Panicum at New Haven, July 20, 1903, on the west side of the city, in a coarse gravel soil, which was sparsely covered with vegetation. I was unable to visit the station at the proper season the next year, and cannot state whether the plant persists there.

Panicum Bicknellii, Nash, occurs occasionally about New Haven, in dry, open woods. There are several small stations for it on the lower slopes of West Rock.

Carex rostrata, Stokes. This species, which Mr. C. H. Bissell has reported from Salisbury, the extreme northwestern town of the State (Rhodora, V. 33), occurs also in the town of Franklin, in the southeastern section of the State. It is abundant here in a wet sphagnous bog near Ayer's Mountain.

Mr. M. L. Fernald has kindly examined the above mentioned plants, and pronounces them correctly named.

New Haven, Connecticut.

COASTAL PLAIN PLANTS IN NEW ENGLAND.

Roland M. Harper.

The coastal plain of the Eastern United States is defined as that part of the country adjoining the Atlantic and Gulf coasts and underlaid by Mesozoic and Cenozoic rocks. From the mouth of the Hudson River to the Rio Grande and beyond, it extends in an uninterrupted belt of varying width but with unmistakable characters, differing considerably from other parts of the country not only in soil, topography and flora but even in population. In the Atlantic states, where the coastal plain is bordered on the west by the Piedmont region of ancient crystalline rocks, its inland boundary is very well marked, and is known as the fall-line, because most of the rivers which cross it have falls or rapids at the point of intersection. The fall-line passes through or near the following cities (and determines the location of most of them): — New York, Trenton, Philadelphia, Baltimore, Washington, Richmond, Raleigh, Columbia, Augusta, Macon and Columbus. West of Georgia the inland boundary of the coastal plain is said to be less conspicuous, but it has been traced from Tuscaloosa, Ala., almost due north to the southern extremity of Illinois, thence southwestward into Mexico.

East of New Jersey there is no genuine fall-line, but most of Long Island, Cape Cod, and the islands of southern New England also belong to the coastal plain, according to definition, though owing to certain geological peculiarities these regions are not quite typical, and are usually discussed separately.

Several interesting papers have been written on the occurrence of "pine-barren plants" on Staten Island, Long Island, and the coastal

plain portions of New England, but the authors of some of them have not stated just what pine-barren plants are, except by implying that they are such species as are found also in the well known "pine-barrens" of New Jersey. It would have been better however to say coastal plain plants, for many of these species range farther south, where they are not confined to the pine-barrens which constitute only a part of the fully developed coastal plain.

But almost anywhere in the interior of New England, over the older rocks whose affinity is with those of the Piedmont region of the Middle and South Atlantic states, can be found species (or even larger groups) of plants which in the South are confined to the coastal plain, or nearly so. This fact has been overlooked by most botanists, doubtless because until quite recently there have been few local floras in which a sharp distinction is made between the coastal plain and the older parts of the country. Since the beginning of the present century however there have appeared two excellent state floras, Mohr's Plant Life of Alabama and Gattinger's Flora of Tennessee, in which such a distinction is made. These can now be supplemented by some of the writer's own observations in Georgia, most of which have not been previously published.

If we study the ranges of these coastal plain plants which occur in New England we find that most of them extend not only southward near the coast but also westward through the northern states to Minnesota or thereabouts, the northern part of their ranges coinciding approximately with the area of Glacial drift. The Drift, as is well known, covers almost the whole of New England, islands and all; and its southern boundary may be located approximately on the map by a line passing through New York, St. Louis, Kansas City, and thence northwestward. The drift overlaps the coastal plain east of New York, and a little in southern Illinois, but in the longitude of Cincinnati, Chattanooga, and Columbus, Georgia (85° W.), the two areas are 500 miles apart.

Nearly all the plants to be discussed below do not range farther west than the 100th meridian, either in the glaciated area or in the coastal plain, the climate of the Great Plains region being too arid for them. It happens that every state east of the Plains contains either coastal plain or glacial drift, or both, hence no gap in the range of any species confined to these two regions is evident from a manual in which ranges are given only or chiefly by states.

In the following list are enumerated some species or genera

which have such a distribution as above described, and are rare or absent in the intervening territory. Under each one the words preceded by "west" refer to its range in the glaciated area, and those preceded by "south" to its range in the coastal plain. It is taken for granted that their ranges in New England and north and east of there, as well as their habitats, are known to the reader. The ranges given have been compiled from several well known works, but are liable to the errors usually inherent in compilations. These notes may serve however as a foundation for more accurate work in the future.

Except where otherwise specified, these plants have all been observed by the writer in the coastal plain of Georgia (and about half of them in central Massachusetts also). Most species whose coastal plain range does not reach Georgia are not considered here.

Woodwardia Virginica (L.) J. E. Smith. West to Michigan and northwestern Indiana, south to Florida, Arkansas and Texas.

Lycopodium (species of the *inundatum* group). In New England and elsewhere in the same latitudes *L. inundatum* is almost the sole representative of this group, but in the southern states there are three species, all confined to the coastal plain, except that *L. pinnatum* has been collected once in the Piedmont region of Georgia,[1] and the other two have each been collected at least once in western North Carolina.[2] No member of this group is reported from Tennessee.

Chamaecyparis thyoides (L.) B. S. P. West to eastern Indiana (*S. Coulter*), south to Florida and Mississippi. In the South it has a rather erratic distribution (apparently skipping Georgia completely), but seems to be strictly confined to the coastal plain.[3]

Potamogeton. This genus is abundantly represented in the glaciated region, less so in the coastal plain, and almost wanting in the Piedmont region and mountains.

Echinodorus parvulus Engelm. West to Minnesota and Missouri, south to Florida and Texas (?).[4]

Sagittaria graminea Mx. West to Nebraska and the Dakotas, south to Florida, western Tennessee and Texas.

[1] See Bull. Torr. Bot. Club, **30** : 294, 326. 1903.

[2] See Lloyd & Underwood, Bull. Torr. Bot. Club, **27** : 155, 157. 1900.

[3] See Torreya, **3** : 122. 1903; and Pinchot & Ashe, Timber Trees and Forests of North Carolina, 120. 1898.

[4] See Robinson, RHODORA, **5** : 89. 1903.

Sagittaria natans, Mx. South to Florida and Alabama.

Dulichium arundinaceum (L.) Britton. West to Minnesota and Nebraska, south to Florida, Tennessee and Texas.

Eleocharis interstincta (Vahl) R. & S. West to Michigan and northern Indiana, south to Florida and Texas. (Also in the West Indies and Mexico).

Eleocharis mutata (L.) R. & S. Distribution very similar to that of the preceding.

Eleocharis Robbinsii, Oakes. West to Michigan, south to Florida. (But apparently not yet detected in most of the states between Delaware and Georgia.)[1]

Eleocharis melanocarpa (Baldw.) Torr. West to Indiana,[2] south to Florida. (Also in the West Indies.)

Eleocharis tuberculosa (Mx.) R. & S. West to Pennsylvania, south to Florida, Arkansas and Texas. Also rarely in western Middle Georgia.[3]

Scirpus Hallii, Gray. West to Illinois and Missouri,[4] south to Florida.

Eriophorum Virginicum, L. West to Saskatchewan and Nebraska, south to Florida (but rare southward). Also in the Cumberland Mountains of Tennessee (*Gattinger*). The other American species of this genus seem to be confined to the glacial drift, or nearly so.

Fuirena squarrosa, Mx. (and some closely related forms or varieties). West to Michigan and Nebraska, south to Florida and Louisiana. The variety *hispida* also occurs rarely in Middle Georgia.

Rhynchospora fusca (L.) Ait. f. West to Michigan, south to Florida. (But apparently not yet reported from Virginia and the Carolinas.)[5] Also in the Cumberland Mountains of Tennessee (*Gattinger*), and in Europe. *R. alba* has a somewhat similar distribution, and one species (*R. capillacea*) seems to be confined to the drift, but the other North American *Rhynchosporae*, some fifty in number, are principally confined to the coastal plain.

Cladium mariscoides (Muhl.) Torr. West to Minnesota and Iowa,

[1] See Bull. Torr. Bot. Club, **30**: 323. 1903.

[2] See E. J. Hill, Bull. Torr. Bot. Club, **25**: 392. 1898.

[3] See Bull. Torr. Bot. Club, **30**: 294, 326. 1903.

[4] Material from the Rocky Mountain region formerly referred to this species was separated by Mr. Fernald a few years ago. (Rhodora, **3**: 251. 1901.)

[5] See Bull. Torr. Bot. Club, **30**: 324. 1903.

south to Florida and Alabama (but apparently not known between Delaware and Georgia).

Scleria verticillata, Muhl. West to Michigan and Indiana, south to Florida and Texas. Also in Mexico and the West Indies.

Lemna. This genus has about the same distribution in America as *Potamogeton.*

Orontium aquaticum, L. West to the Pocono plateau of Pennsylvania, south to Florida, Missouri and Texas. Also rarely in northwest Georgia (*Harper*) and adjacent Tennessee (*Gattinger*).

Xyris. The North American species are nearly all confined to the coastal plain,[1] except *X. flexuosa* and *X. montana*, which are rather widely distributed in the glaciated region.

Eriocaulon. Represented in New England only by *E. septangulare*, With., which ranges west to Minnesota, and south in the coastal plain to Florida and Mississippi (but it is not definitely known in the States between New Jersey and Georgia). The other North American species seem to be confined to the coastal plain, except that *E. decangulare* is known from a few stations in the mountains of North Carolina and Tennessee.

Pontederia cordata, L. West to Minnesota and Saskatchewan, south to Florida, Arkansas and Texas. Also at one station in Middle Tennessee (*Gattinger*).

Juncus scirpoides, Lam. West to Indiana, south to Florida, Arkansas and Texas.

Tofieldia. Represented in eastern North America by two species in the glacial region (one of them also occurring in the mountains of North Carolina) and two others in the coastal plain, one ranging from New Jersey to Louisiana and the other known only from the Carolinas.

Gyrotheca tinctoria (Walt.) Salisb. Seems to be confined to the coastal plain, ranging from New England to Florida and Mississippi. Also in Cuba.

Habenaria ciliaris (L.) R. Br. West to Michigan and northern Indiana, south to Florida, Arkansas and Louisiana. Also rarely in Northwest Georgia (*P. Wilson*), northern Alabama (*Mohr*), and East Tennessee (*Gattinger*).

Habenaria blephariglottis (Willd.) Torr. West to Minnesota, south

[1] See Bull. Torr. Bot. Club, **30**: 326. 1903.

to Florida and Louisiana. (But apparently not yet known in Virginia and the Carolinas.)

Myrica. All the American representatives of this genus seem to be confined to the glacial region and coastal plain (except that Dr. Mohr has reported *M. pumila* from one station in upper Alabama). One species, *M. Carolinensis*, Mill. (until recently confused with the more southern *M. cerifera*, L.), is common to both regions, but with a striking diversity of habitat. In central Massachusetts it grows principally in rocky pastures, in Virginia on the dunes along the coast, and in Georgia usually on sandy margins of swamps.

Sarracenia purpurea, L. West to Minnesota and British Columbia (?), south to Florida and West Tennessee. The other six species of the genus are confined to the coastal plain, except that two or three of them occur locally in Western North Carolina and the mountains of Alabama (possibly also in upper Georgia).

Drosera filiformis, Raf. South to Florida and Mississippi, but not extending very far from the coast. This genus seems to be almost wanting in the Piedmont region and southern mountains.

Rosa Carolina, L. West to Minnesota, south to Florida, Arkansas and Louisiana. (Not reported from Alabama.)

Aronia arbutifolia (L.) Ell. West to the Dakotas and Nebraska, south to Florida, Arkansas and Louisiana. Also in the mountains of Tennessee (*Gattinger*) and rarely in Middle Georgia.

Polygala cruciata, L. West to Minnesota and Kansas (?), south to Florida and Louisiana. Also in East Tennessee (*Gattinger*) and western Middle Georgia.[1]

Ilex glabra (L.) Gray. Almost confined to the coastal plain. South to Florida and Louisiana. Also in Carroll County, Middle Georgia (*C. L. Boynton*).[2]

Viola lanceolata, L. West to Minnesota, south to Georgia and Texas. Also in the mountains of Tennessee (*Gattinger*).

Decodon verticillatus (L.) Ell. West to Minnesota (?), south to Florida and Louisiana. Also rarely in Northwest Georgia (*P. Wilson*) and Tennessee (*Gattinger*), but probably not found in the Blue Ridge and Piedmont region.

Rhexia Virginica, L. West to Indiana and Kansas, south to Flor-

[1] See Bull. Torr. Bot. Club, 30: 294. 1903.
[2] Biltmore Bot. Stud. 1: 144, 145. 1902.

ida, Louisiana and Arkansas. Also at several interior points, but most abundant in the coastal plain.

Ludwigia sphaerocarpa, Ell. South to Florida and Louisiana (?). Seems to be confined to the coastal plain.

Proserpinaca pectinata, Lam. Distribution similar to that of the preceding.

Hydrocotyle umbellata, L. West to Minnesota (?), south to Florida and Texas. Also in the tropics.

Ptilimnium capillaceum (Mx.) Raf. West to Minnesota (?), south to Florida and Texas.

Clethra alnifolia, L. South to Florida and Louisiana. Apparently confined to the coastal plain except in New England,[1] and nowhere more than 200 miles from the coast.

Azalea viscosa, L. West to Ohio, south to Florida, Arkansas and Texas. Also reported from the mountains of Tennessee and Alabama.

Leucothoe racemosa (L.) Gray. South to Florida, Louisiana and Missouri. Also in East Tennessee (*Gattinger*).

Pieris Mariana (L.) B. & H. South to Florida and Arkansas. Also in the mountains of Tennessee (*Gattinger*). Not reported from Alabama.

Gaylussacia dumosa (Andr.) T. & G. South to Florida and Louisiana in the coastal plain. Also on the sunny slopes of some of the mountains of Georgia, and at a few other interior localities,[2] but apparently never more than 300 miles from the coast.

Sabbatia dodecandra (L.) B. S. P. South to North Carolina near the coast, and replaced farther south by two or three species recently separated from this, all confined to the pine-barren region.

Limnanthemum lacunosum (Vent.) Griseb. West to Minnesota, south to Florida, Mississippi, West Tennessee, Arkansas and Louisiana.

Gerardia paupercula (Gray) Britton. Nearly throughout the glaciated region, also in the pine-barrens of Georgia and Alabama, but not yet reported from intermediate stations.

Gerardia Skinneriana, Wood. West to Minnesota and Iowa, south to Florida and Louisiana. In Georgia confined to the pine-barrens.

[1] See RHODORA, **2**: 70. 1900.

[2] See Small, Bull. Torr. Bot. Club, **21**: 18, 19. 1894.

Pinguicula. The North American species are confined to the glaciated region and to the pine-barrens from North Carolina southwestward, but none are common to the two regions.

Utricularia inflata, Walt. South to Florida, West Tennessee, and Texas.

Utricularia purpurea, Walt. West to northern Indiana, south to Florida and Alabama.

Utricularia resupinata, B. D. Greene. West to Michigan and northern Indiana. Also in the pine-barrens of Georgia and Florida, but not yet reported from intermediate stations.

Utricularia cornuta, Mx. West to Minnesota, south to Florida and Louisiana. (Not reported from Alabama or Tennessee.) In Georgia confined to the pine-barrens.

Utricularia subulata, L. South to Florida, Arkansas, and Texas. Also in the tropics.

Eupatorium verbenaefolium, Mx. South to Florida and Louisiana in the coastal plain. Also in East Tennessee (*Gattinger*) and Pike County, Middle Georgia.[1]

It will be noticed by persons familiar with the above-mentioned plants that they all grow either in or around ponds, in wet meadows, or in sandy or sphagnous bogs; but many of them exhibit what ecologists term xerophytic structures. (The explanation of this apparent anomaly of structure is usually sought in the properties of the soil, but it would seem that illumination has just as much to do with it, for with few exceptions they are sun-loving plants). And as Dr. Hollick noted in the case of the northern "pine-barren" plants, they are nearly all endemic to eastern North America.

No mention has been made of weeds, for their distribution is so erratic as to be of little significance in this connection; or of plants of salt marshes and dunes, for they occur along the coast in almost any part of the world, regardless of whether a coastal plain is present or not.

In the case of the true aquatics in the above list their distribution is easily accounted for by the fact that there are no natural ponds in the Blue Ridge and Piedmont region, the two principal pond-forming agencies, glaciers and limestone, never having been present in those parts. (Even in the middle of the coastal plain of Georgia there is

[1] See Bull. Torr. Bot. Club, **30**: 294. 1903.

an area of at least 10,000 square miles where most of these aquatics are wanting for a similar reason.)

For the distribution of the other plants under consideration the explanation is probably to be found in the nature of the soil. It happens that almost the whole surface of the coastal plain is covered with unconsolidated sedimentary deposits (principally the Lafayette and Columbia formations) which are of about the same age as the glacial drift and resemble it to a considerable extent in chemical and physical composition. The Columbia in particular, the newest and uppermost, is often (perhaps usually) composed of almost pure sand, scarcely distinguishable from the more sandy phases of the drift. Streams rising in that part of the country covered by Pleistocene sands (whether Columbia or glacial) are rarely or never muddy but usually discolored with vegetable matter, while in the Piedmont region clay soil and muddy streams predominate (giving rise to the impression common among some people who have traveled a little that all Southern rivers are muddy).

The plants under discussion all grow on these well washed Pleistocene sands or in peaty deposits overlying them, all of which are very deficient in available plant food. Peat-bogs are not confined to cool climates as some may suppose (because of their abundance in the glaciated regions in which most scientists live, both in North America and Europe), but are equally characteristic of the coastal plain. Okefinokee Swamp, in the extreme southern part of Georgia, with an average annual temperature of about 70° F. (and less rainfall than almost any other part of that state), is mainly a vast peat-bog, containing about the same proportions of sphagnum, ferns, carnivorous herbs, Ericaceous shrubs and coniferous trees as the well known cedar-swamps of New England (and with not a few species in common).

It will be noticed that (taking the Engler & Prantl sequence as a criterion) most of the species above mentioned stand rather low in the scale (for vascular plants, the lower cryptogams not being considered here), also that there are few trees and shrubs among them. This is doubtless due to the comparative newness and sterility of the soil in which they grow. It is well known that when a soil is first thrown open to settlement for plants, as in an area recently emerged from the sea or laid bare by glaciers, it is first taken possession of by the lowest forms of vegetation, such as algae, lichens and mosses,

which gradually modify and enrich the soil, thus paving the way for higher plants. Those here discussed seem to be all species which take very little nourishment from the soil, and some of them (the Sarracenias, Droseras, Pinguiculas and Utricularias) depend on the animal kingdom for a part of their sustenance.

On examining the ranges of these plants it will be noticed that a few of them do not extend very far inland in the glaciated region, but whether this has any special significance or not it is difficult to say. Quite a number which were formerly thought to be confined to the vicinity of the coast have since turned up near the Great Lakes, in the upper Mississippi valley, or at other interior points. The great gaps in the known ranges of some are surprising, but may be due only to imperfect exploration.

The origin of species having ranges like those above described is an interesting question. During the Pleistocene period the glacial region and coastal plain were both uninhabitable (one being covered with ice and the other with water) and before that their soils were very different from what they are now, so it is almost certain that most of the species at present chiefly confined to those regions have originated since then. The few which now occupy isolated stations in the Piedmont region and southern mountains may of course have been there before the Pleistocene, but it seems more likely that they have migrated there in comparatively recent times from the regions where they are now much more abundant.

The glaciated region, like the coastal plain, doubtless has its own endemic species, but to attempt to enumerate them would be beyond the scope of this paper, and would require more knowledge of that region than the writer possesses.

All the above remarks are intended to be merely suggestive, rather than exhaustive and the list here given can doubtless be considerably extended by further study. With the increased attention that botanists are now paying to geography we may reasonably expect a great deal of new light on the subject in the near future. In tracing ranges for phytogeographical purposes care must always be taken to discriminate against introduced plants, whether introduced from foreign countries or from other parts of the same state. In few local floras is such a distinction made. The *Nymphaeaceae* and some other aquatics are particularly liable to appear in new localities through the indirect agency of man, establishing themselves readily in artificial ponds and ditches outside of their natural range.

In pursuing this subject further the following works will be found helpful: —

BAILEY, W. W. Pine barren plants in Rhode Island. Bull. Torr. Bot. Club, **7**: 98, 99. 1880.

BRITTON, N. L. On the northward extension of the N. J. pine-barren flora on Long and Staten Islands. Bull. Torr. Bot. Club, **7**: 81–83. 1880.

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Gaz., **36**: 401–420. 1903. (In this paper, by an arbitrary selection of species, the apparent preponderance of bog-plants in the glacial region, as compared with the southern coastal plain, is greatly exaggerated.)

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In some of these works will be found numerous other references, leading to a long chain of interesting literature.

College Point, Long Island, New York.

Hieracium murorum in Massachusetts. — On the 15th of June, 1904, while exploring in the woods on the outskirts of Northampton, Massachusetts, I found in a damp, mossy hollow, a yellow flower belonging to the *Compositæ*, which was new to me. I took it home for study, and made it out to be *Hieracium murorum*, L. My only hesitation in so naming it arose from the fact that the plant was not credited to New England, in any of the books. However, I sent it to Mr. Fernald, who pronounced it good *Hieracium murorum*. There was quite a colony of it growing in the hollow, and the bright yellow blossoms in the mossy bed made a very attractive sight. — Emily Hitchcock Terry, Northampton, Massachusetts.

Actinella odorata in Maine.—*Actinella odorata*, Gray, a native of the Southwest (Texas, Mexico, etc.), was found at Waterville, Maine, last summer, by Mr. S. Plaisted. It was growing on waste from a cotton mill and was in bloom in June. A specimen was sent to the Gray Herbarium, where it was identified by Dr. J. M. Greenman, who states that the species has not been reported from Maine. — A. R. Meader, Waterville, Maine.

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F. Schuyler Mathews del.

DRABA INCANA AND ALLIES.

Rhodora

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THE NORTH AMERICAN SPECIES OF ERIOPHORUM.

M. L. Fernald.

PART 1. SYNOPSIS OF AMERICAN SPECIES.

The genus *Eriophorum*, familiarly known as Cotton Grass, is generally distributed in the boreal regions of the northern hemisphere; and on account of its conspicuous perianth the genus is perhaps more quickly recognized by the general student than other members of the *Cyperaceae*. In spite of this comparative ease of recognition, or perhaps because of it, the genus, as understood in America, has come to be one with ill-defined botanical limits, and not sharply separated from some sections of the genus *Scirpus*; while its species as ordinarily interpreted in American floras are in an unfortunate state of confusion. A prolonged study of the material in the Gray Herbarium and the herbarium of the New England Botanical Club, supplemented by the very extensive collections of the Geological Survey of Canada, generously loaned by Mr. J. M. Macoun, and the material in several private herbaria, has led the writer to prepare the following synopsis of the American species. This synoptic treatment will be followed by a detailed discussion of the history and some of the affinities of the genus *Eriophorum*, with notes on certain species which have been misinterpreted in past treatments of the group. In the bibliography of this work the writer has been greatly assisted by Miss Mary A. Day.

Synopsis of Species.

§ **VAGINATA**, Andersson, Cyp. Scand. 13 (1849). Spikelet solitary, without involucral leaves; the lowermost scale usually en-

larged and more veiny than the others: culms usually bearing loose bladeless sheaths, or with only reduced blades.

* Stoloniferous: culms mostly solitary: empty scales at the base of the spikelet few (usually 7 or less).

+ Anthers 1 mm. long: flowering spikelet obovoid; in fruit becoming globose, as broad as high: scales with very narrow pale margin.

E. Scheuchzeri, Hoppe. Culms soft, 0.5–3.5 dm. high: caudex loosely stoloniferous: leaves channeled or strongly involute, much shorter than the culms; those of the sterile shoots soft, 3–12 cm. long: culms at base slightly leafy, above usually bearing a bladeless loose membranous-edged black-tipped sheath (2–7 cm. long): flowering spikelet broadly obovoid or subglobose, 8–12 mm. long: scales lead-color or blackish, with slightly paler margins; the 1 to 3 outer ones ovate; the others ovate-lanceolate to lance-attenuate: fruiting spikelet depressed-globose, 2–2.5 cm. high: the bristles bright white: achenes narrowly obovoid, plano-convex or slightly 4-angled, 1.7–2.5 mm. long, 0.7–1 mm. broad, with a short slender beak. — Bot. Taschenb. (1800) 104, App. t. 7; Reichenb., Ic. Fl. Germ. viii. 35, t. 289, fig. 685 (1846); Ledeb., Fl. Ross. iv. 253 (1853); Bcklr., Linnaea, xxxvii. 92 (1871) & Cyp. Königl. Herb. Berlin, 628; Lange, Consp. Fl. Groenl. 129 (1880); Nyman, Consp. 762 (1882); Richter, Pl. Eur. i. 136 (1890); Norman, Christiania Vidensk.-Selsk. Forhandl. (1893) no. 16, 45; Clarke in Hook., Fl. Brit. Ind. vi. 664 (1893); Palla, Bot. Zeit. liv. ab. 1, 151 (1896); Britton & Brown, Ill. Fl. i. 272 (1896), in part; Ostenfeld, Fl. Arct. 41 (1902). *E. capitatum*, Host, Gram. i. 30, t. 38 (1801); Engl. Bot. xxxiv. t. 2387 (1812); Hornem., Fl. Dan. ix. t. 1502 (1818); Torr., Ann. Lyc. Nat. Hist. N. Y. iii. 336 (1836), except as to syn. *E. callithrix*; Hook., Fl. Bor.-Am. ii. 231 (1839), as to Labrador and Arctic plant; Anders., Cyp. Scand. 13, t. 2, fig. 31 (1849) and Bot. Not. (1857) 78; Macoun, Cat. Can. Pl. ii. 104 (1888) as to Labrador and Arctic plant at least. *E. leucocephalum*, Bcklr., Flora, xli. 419 (1858). Arctic America, extending south on the Labrador coast to Square Island (latitude 52° 44′), in the Rocky Mts. to the head of Lake Louise, Alberta (lat. 51°) and Revelstoke, British Columbia, and on the Alaska coast to Sitka (latitude 57°). Arctic Europe and Asia.

+ + Anthers 1.5–3 mm. long, slightly shorter than the filaments: flowering spikelet cylindric; in fruit becoming obovoid, distinctly longer than broad: scales with broad, pale margin.

E. Chamissonis, C. A. Meyer. Loosely stoloniferous: sterile shoots bearing slender channeled leaves 1–6.5 dm. long: culms slender, terete, 1–8 dm. high: the lowest reddish brown sheaths blade-bearing; the uppermost scarcely inflated and mostly bladeless (3.5–10 cm. long): flowering spikelet oblong-cylindric, 1.5–2 cm. long: scales brownish-lead-color to blackish, with distinct whitish margin, ovate to ovate-lanceolate, bluntish: fruiting spikelet 2.5–4 cm. long: bristles reddish or cinnamon color: achenes trigonous.— C. A. Meyer in Ledebour, Fl. Alt. i. 70 (1829), as to description for the most part, synonymy, and citation of the Unalaskan specimen but not the Altai plant, and Mém. Sav. Étrang. Acad. St. Pétersb. i. 204, t. 3 (1831), except the Altai plant; Torr., Ann. Lyc. Nat. Hist. N. Y. iii. 337 (1836), mostly; Fries, Novit. Mant. ii. 1 (1839); Ledeb., Fl. Ross. iv. 253 (1853), mostly; Bcklr., Linnaea, xxxvii. 93 (1871), and Cyp. Königl. Herb. Berlin, 629; Richter, Pl. Eur. i. 136 (1890). *E. intermedium*, Chamisso, ex C. A. Meyer, ll. cc., (1829, 1831), as synonym, not Bast. *E. vaginatum*, *β. medium*, Laestad., ex Fries, l. c. (1839), as synonym. *E. fulvellum*, LaPylaie, ex Fries, l. c., 2 (1839), as synonym. *E. russeolum*, Fries, l. c., 2 (1839), as synonym, and l. c. iii. 170 (1842); Anders., Cyp. Scand 13, t. 2, fig. 32 (1849), and Bot. Not. (1857) 80; Blytt, Norges Fl. 271 (1861); Liebm. & Lange, Fl. Dan. Suppl. t. 8 (1874); Nyman, Consp. 762 (1882); Macoun, Cat. Can. Pl. ii. 104 (1888); Norman, Christiania Vidensk.-Selsk. Forhandl. (1893) no. 16, 45: Palla, Bot. Zeit. liv. ab. 1, 151 (1896); Britton & Brown, Ill. Fl. i. 272 (1896); Ostenfeld, Fl. Arct. 42 (1902). *E. vaginatum* γ, Hook., Fl. Bor.-Am. ii. 231 (1839), fide Fries, Novit. Mant. iii. 170. *E. capitatum*, Hook., Fl. Bor.-Am. ii. 231 (1839), as to synonym *E. Chamissoi*, not Host; Macoun, Cat. Can. Pl. ii. 104 (1888) as to Moose Factory plant. *E. Chamissoi*, Hook., Fl. Bor.-Am. ii. 231 (1839), in synonymy. *E. Scheuchzeri*, var. *Chamissonis*, F. Nylander, Acta Soc. Sc. Fenn. iii. (1852), and in Anders., Bot. Not. (1857) 58. *E. medium*, Anders. Bot. Not. (1857) 62. *E. rufescens*, Anders., Bot. Not. (1857) 79. *E. vaginatum*, b., Bcklr., Linnaea, xxxvii. 94 (1871), and Cyp. Königl. Herb. Berlin, 630. *E. russeolum*, var. *rufescens*, Hartm., Handb. ed. 11, 450 (1879).— Labrador and Alaska, locally south to Newfoundland, Saint Pierre, Miquelon, Quebec (ascending to the summit of Mt. Albert), Prince Edward Island, New Brunswick and Northern Nova Scotia; James Bay, and Mer Bleue,

Ontario; Lake Huron (fide Hook., Fl. Bor. Am.); Yellowstone National Park, Montana, Idaho, Washington and Vancouver. Arctic and subarctic Europe and Asia. Flowering June and July; fruiting July and August (mature in eastern New Brunswick, July 16, on Mt. Albert, Quebec, August 27).

Var. **albidum**, n. comb. Bristles white.— *E. russeolum*, var. *albidum*, F. Nylander, Acta Soc. Sc. Fenn. iii. (1852), & in Anders., Bot. Not. (1857) 58. *E. russeolum*, var. *candidum*, Norman, Ind. Supp. 46 (1864); Hartm., Handb. ed. 11, 450 (1879).— Same range as the species but less common, except perhaps about Behring Sea.

* * Caespitose, not stoloniferous: empty scales at the base of the spikelet numerous (usually 10–15).

+ Flowering spikelet oblong, 1–3 cm. long: anthers 2–3 mm. long: fruiting spikelet subglobose or broadly obovoid, as high as broad.

E. VAGINATUM, L. Densely caespitose, forming broad tussocks with very numerous stiff obtusely trigonous culms (1.5–7 dm. high): basal sheaths brown, long-persistent, fibrillose; basal leaves slender, trigonous, smooth or scabrous; cauline sheaths 2, conspicuously inflated above, veiny-reticulate, with dark (usually black) membranous tip: scales obovate to ovate-lanceolate, long-acuminate, lead-color or blackish, with whitish or pale margins: bristles glossy white. — Sp. 52 (1753); Engl. Bot. xiii. t. 873 (1801), ed Syme, x. 71, t. 1604 (1873); Baxter, Brit. Bot. vi. t. 427 (1843); Reich., Ic. Fl. Germ. viii. t. 289, fig. 686 (1846); Palla, Bot. Zeit. liv. ab. 1, 148, 151 (1896); Ostenfeld, Fl. Arct. 40 (1902); &c. *E. caespitosum*, Host, Gram. i. 30, t. 39 (1801).— YUKON DISTRICT, White Horse Rapids, Yukon River, Sept. 1, 1902 (*J. Macoun*, Herb. Geol. Surv. Can. no. 53,839): MACKENZIE DISTRICT, Artillery Lake, May 29, 1900 (*J. W. Tyrrell*, Herb. Geol. Surv. Can., no. 23,138). Northern Europe and Asia, and western Greenland.

The Tyrrell material from Artillery Lake is very fragmentary; but the oblong flowering spikelets, long anthers and very inflated sheaths are quite like those of the Old World *E. vaginatum*. The Macoun plant from the Yukon has the leaves harshly scabrous, a character unusual in the European plant, but noticeable in some Scandinavian specimens. Most other American material which has passed as *E. vaginatum* belongs to the two following species.

+ + Flowering spikelet obovoid or subglobose, 0.8–1.5 cm. long: anthers 1–2 mm. long: fruiting spikelet depressed-globose, broader than high.

++ Upper sheaths distinctly inflated: culm trigonous and (under the lens) scabrous at tip: pits of the receptacle with obtusely angled lower walls.

E. CALLITRIX, Chamisso. Similar to *E. vaginatum*: but with leaves generally scabrous in lines; the 1 or 2 upper sheaths less inflated: the flowering spikelet shorter and broader: the anthers shorter: the fruiting spikelet depressed-globose, 2.5–5 cm. broad.— Chamisso in C. A. Meyer, Mém. Sav. Étrang. Acad. St. Pétersb. i. 203, t. 2 (1831); Torr., Ann. Lyc. Nat. Hist. N. Y. iii. 337, (1836), in note; Ledeb., Fl. Ross. iv. 254 (1853), not Andersson and other European Authors. *E. caespitosum*, Pursh, Fl. i. 57 (1814); Eaton, Man. ed. 4, 294 (1824); not Host. *E. vaginatum*, Torr., Fl. 65 (1824), Ann. Lyc. Nat. Hist. N. Y. iii. 335 (1836), and Fl. N. Y. ii. 358, t. 141 (1843); Beck, Bot. 427 (1833); Hook., Fl. Bor.-Am. ii. 231 (1839), in part; Gray, Man. 529 (1848); Macoun, Cat. Can. Pl. ii. 103 (1888), in part; Britton & Brown, Ill. Fl. i. 272 (1896); not L. *E. Chamissonis*, C. A. Meyer in Ledeb., Fl. Alt. i. 70 (1829) and Mém. Sav. Étrang. Acad. St. Pétersb. i. 204 (1831), as to Altai plant, but not description and plate, &c. *E. capitatum*, *β*, Hook., Fl. Bor. Am. ii. 231 (1839). *E. virginatum*, Eaton & Wright, N. A. Bot. 237 (1840). *E. vaginatum*, var. *humile*, F. Nylander, Acta Soc. Sc. Fenn. iii (1852), and in Andersson, Bot. Not. (1857) 58. *E. brachyantherum*, Trautv. & Meyer in Middend., Reise,— Fl. Ochot. 98 (1856); Palla, Bot. Zeit. liv. ab 1, 148, 151 (1896).— Baffin Land and Ungava across North America to Behring Sea, and in northeastern Asia to the Altai; south in America to Pennsylvania, Michigan, Wisconsin, and Manitoba. Flowering, arctic and alpine regions, June, July; southern New England and Pennsylvania, early May: fruiting, arctic regions, July, August; southern New England, &c., late May and early June.

Var. **erubescens**. Bristles reddish brown. — NEWFOUNDLAND, sphagnous soil on rocky hill, Channel, July 27–August 1, 1901 (*Howe & Lang*, no. 899).

++ ++ Upper sheaths close or scarcely inflated: culm terete, glabrous at tip: pits of the receptacle with rounded lower walls.

E. opacum, n. comb. Loosely caespitose, forming small tufts with few very slender terete glabrous culms (3–6 dm. high): basal leaves nearly filiform, glabrous; cauline sheaths often with short

blades, the remote uppermost barely inflated toward the dark-edged tip: flowering spikelet globose-obovoid, barely 1 cm. long; fruiting spikelet globose, 2–3.5 cm. broad: scales lead-color, the outer ovate-lanceolate, the inner lance-attenuate: bristles sordid-white.—*E. vaginatum*, var. *opacum*, Björnstr., Grunddr. af Piteå Lappm. Växtfys. 35 (1856); Fries, Bot. Not. (1857) 11. *E. callitrix*, Anders. Bot. Not. (1857) 60; Fries, Bot. Not. (1858) 63; Blytt, Norges Fl. 270 (1861); Liebm. & Lange [*callithrix*], Fl. Dan. Suppl. t. 122 (1874); Hartm., Skand. Fl. ed. 11, 450 (1879); Palla, Bot. Zeit. liv, ab. 1, 148, 151 (1896); Ostenfeld, Fl. Arct. 41 (1902); not Chamisso. *E. vaginatum*, Macoun, Cat. Can. Pl. ii. 103 (1888), in part. Examined from the following American stations. Ontario, peat bogs, Hastings County, July 21, 1873 (*J. Macoun*): Saskatchewan, muskeag north of Prince Albert, July 3, 1896 (*J. Macoun*, Herb. Geol. Surv. Can., no. 16,384): Athabasca, bogs, Clearwater River, July 11, 1888 (*J. M. Macoun*, Herb. Geol. Surv. Can., no. 32,297): Alberta, boggy places, Canmore, June 30, 1885 (*J. Macoun*, Herb. Geol. Surv. Can., no. 32,293); Banff, July 4, 1891 (*J. Macoun*, Herb. Geol. Surv. Can., no. 7,574); outlet of Lake Louise, August 14, 1897 (*E. Brainerd*): Yukon, marsh, 1500 feet above Hunker Creek, July 27, and Independence Creek, Aug. 1, 1902 (*J. Macoun*, Herb. Geol. Surv. Can., nos. 53,840 and 53,943): British Columbia, east of Stewart's Lake, June 19, 1875 (*J. Macoun*, Herb. Geol. Surv. Can., no. 32,292); headwaters of Fraser River, July 21, 1898 (*W. Spreadborough*, Herb. Geol. Surv. Can., no. 20,779). Very local in Arctic Europe and Asia.

§ § **PHYLLANTHELA**, Andersson, Cyp. Scand. 12 (1849). Spikelets several (rarely 1), subtended by 1 or more foliaceous bracts.

* Leaves slender, triangular-channeled throughout: involucre a single upright slender colored bract much shorter than the inflorescence.

+ Upper cauline leaf with the sheath longer than the blade.

E. gracile, Koch. Weak and very slender, the subterete glabrous culms 2–6 dm. high, with no young basal leaves developed at flowering season: sheath of the upper cauline leaf 3.5–5.5 cm. long, the round-tipped smooth blade 1–4 cm. long, 1–1.5 mm. broad: involucral bract similar, usually dark at base, 1–2 cm. long: spikelets 2 to 5, the central one subsessile, the others on slender unequal minutely hairy spreading-ascending or finally nodding peduncles (0.5–3 cm.

long), in anthesis narrow-ovoid, 7–10 mm. long, in fruit 1.5–2 cm. long: scales lead-color or blackish, ovate to short-oblong, 2.5–4 mm. long, all but the outermost blunt or rounded-tipped: anthers linear, 1–2 mm. long: achenes linear-oblanceolate, blunt, compressed, trigonous, 1.5–2 mm. long: bristles white.— Koch in Roth., Cat. ii. 259 (1800); Torr., Ann. Lyc. Nat. Hist. N. Y. iii. 341 (1836); Reich., Ic. Fl. Germ. viii. t. 290 (1846); Gray, Man. 529 (1848), in part; Engl. Bot. Suppl. iv. t. 2886 (1849) and ed. Syme, x. 74, t. 1607 (1873); Ett. & Pok., Phys. Pl. Austr. vi. t. 533 (1873); Watson, Bot. Cal. ii. 220 (1880), in part; Palla, Bot. Zeit. liv. ab. 1, 148, 151 (1896); Britton & Brown, Ill. Fl. i. 273 (1896), in part; A. A. Eaton, Bull. Torr. Club, xxv. 340 (1898); Britton, Man. 182 (1901). *Linagrostis paniculata*, β, Lam., Fl. Fr. iii. 555 (1778). *Eriophorum triquetrum*, Hoppe, Taschenb. (1800) 106. *E. polystachyon*, var. *tenellum*, Gray, Gram. & Cyp. pt. 1, no. 91 (1834), in part. *E. angustifolium*, Torr., Ann. Lyc. Nat. Hist. N. Y. iii. 339 (1836), in part, not Roth. *E. angustifolium*, β ? *brevifolium*, Torr., l. c. 340 (1836), in part.— Cold swamps and bogs, Gulf of St. Lawrence to Hudson Bay and British Columbia, south to Connecticut, Pennsylvania, Michigan, Nebraska, and California. Northern Europe and Asia. Flowering, April, May: fruiting May–July.

Var. **caurianum**. Involucre and scales straw-color or brownish: achenes 2.5–3 mm. long. — OREGON, subalpine regions, 1886 (*W. C. Cusick*, no. 1450): CALIFORNIA, Sierra County, 1874 (*J. G. Lemmon*); south side of Mt. Shasta, alt. 5000–10,000 feet, July, 1897 (*H. E. Brown*, no. 628). A somewhat coarser plant than true *E. gracile*, but with the characteristic short blunt upper leaf.

+ + Upper cauline leaf with the sheath shorter than the blade.

E. TENELLUM, Nutt. Culms stiff, obtusely trigonous, scabrous above, 3–9 dm. high, with long slender green sharp-pointed often scabrous basal leaves: sheath of the upper cauline leaf 2.5–8 cm. long; the scabrous sharp-pointed blade 3–18 cm. long: involucral bract straw-color to reddish-brown at base, 1.5–6 cm. long: spikelets 3 to 6, mostly on unequal scabrous peduncles (0.5–3.5 cm. long), in fruit 2–2.8 cm. long: scales greenish straw-color to reddish brown, 2.5–5 mm. long: achenes linear-oblong, 2.5–3 mm. long, short-beaked: bristles whitish. — Gen., Additions (1818); Palla, Bot. Zeit. liv. ab. 1, 148, 151 (1896). *E. polystachyon*, var. *tenellum*, Gray, Gram. &

Cyp. pt. 1, no. 91 (1834), in part. *E. angustifolium*, Torr., Ann. Lyc. Nat. Hist. N. Y. iii. 339 (1836), in part, not Roth. *E. angustifolium, β ?brevifolium*, Torr. l. c. 340 (1836), in part. *E. gracile, β. paucinervium*, Engelm., Am. Jour. Sci. xlvi. 103 (1844); Gray, Man. ed. 2, 502 (1856). *E. gracile*, Gray, Man. 529 (1848); Britton & Brown, Ill. Fl. i. 273 (1896), in part, including fig. 642. *E. paucinervium*, A. A. Eaton, Bull. Torr. Cl. xxv. 341 (1898); Britton, Man. 182 (1901). — Swamps and bogs, Newfoundland to Ontario, south to New Jersey and Illinois. Fruiting July and August.

* * Leaves flat, at least below the middle: involucre (except in dwarf variety of *E. polystachion*) of 2 or more bracts.

+ Scales of the spikelet with only 1 prominent rib: stamens 3.

++ Midrib of the scale prominent only below the membranous tip: leaves triangular-channeled above the middle; the upper sheaths dark-girdled at summit.

E. polystachion, L. Culms 2–6 dm. high, slender, obtusely angled: basal leaves several, elongate, usually conduplicate, especially above the middle; cauline leaves few, remote, stiff, flat only toward the base, 1.5–15 cm. long, 1.5–4 mm. broad, the margins scabrous: involucral bracts 2 or 3, dark-colored at least at base, the longest 2–9 cm. long: spikelets 2 to 10, the central subsessile, the others on divergent or drooping stout mostly glabrous peduncles (0.5–7 cm. long), in anthesis ovoid, 1–2 cm. long, in fruit 2.5–4.5 cm. long: scales lead-color to castaneous, ovate to lanceolate, acutish, 4–10 mm. long, the slender midrib disappearing below the pale membranous tip: anthers linear, 2.5–5 mm. long: achenes oblong-obovoid, compressed-trigonous, 2.7–3.5 mm. long: bristles bright white. — Sp. 52 (1753); Schk., Handb. i. 28, t. 8 (1791); Curt., Fl. Lond. iv. t. 9 (1821); Hook. [*polystachyon*], Fl. Bor.-Am. ii. 231 (1839); Reich. [*polystachyum*], Ic. Fl. Germ. viii. 35, t. 291 (1846); Britton & Brown [*polystachyon*], Ill. Fl. i. 273 (1896), in part; Britton, Man. 182 (1901), in part. *Linagrostis polystachia*, Scop., Fl. Carn. ed. 2, i. 48 (1772). *Eriophorum angustifolium*, Roth., Tent. i. 24 (1788), ii. 63 (1789), and Neue Beitr. 94 (1802); Engl. Bot. viii. t. 564 (1799); Hornem., Fl. Dan. ix. t. 1442 (1818); Beck, Bot. 427 (1833); Koch, Syn. 745 (1837); Hook., Fl. Bor.-Am. ii. 231 (1839), in part; Thomé, Fl. Deutschl. i. t. 102 B, C. (1886); Palla, Bot. Zeit liv. ab. 1, 148, 151 (1896). *E. angustifolium, β. laxum*, Mert. & Koch, Deutschl. Fl. i. 456 (1823). ? *E. strictum*, R. Br. in Richards., App. Franklin Jour.

731–reprint 3 (1823); Torr., Ann. Lyc. Nat. Hist. N. Y. iii. 341 (1836); Hook., l. c. 232. *E. angustifolium*, var. *vulgare*, Koch, Syn. ed. 2, 860 (1844). *E. polystachyon*, var. *angustifolium*, Gray, Man. 529 (1848). *E. angustifolium*, var. *genuinum*, Engl. Bot. ed. Syme, x. 73, t. 1605 (1873). — Arctic America, south to Newfoundland, Nova Scotia, New Brunswick, Quebec, Lake Superior, and British Columbia. Europe and Asia. Fruiting, southern Canada, June, July; arctic regions, July and August.

Var. ELATIUS, Bab. Stout and tall (3–9 dm.): cauline leaves 4–8 mm. broad. — Man. 333 (1843). *E. polystachion*, Engl. Bot. viii. t. 563 (1799); Host, Gram. i. 29, t. 37 (1801); Coult., Man. 368 (1885). *E. angustifolium*, *β. majus*, Schultz, Fl. Starg. Suppl. 5 (1819). *E. angustifolium*, var. *elatius*, Mert. & Koch, Deutchl. Fl. i. 456 (1823); Koch, Syn. ed. 2, 860 (1844). Engl. Bot. ed. Syme, x. 73 (1873). *E. ocreatum*, A. Nelson. Bull. Torr. Cl. xxix. 400 (1902). *E. polystachyon*, var. *majus*, Aschers. & Graebn., Syn. ii. ab. 2, 334 (1903). — Subarctic America, south to central Maine, Ontario, Illinois, Wisconsin, Iowa, and the mountains of Colorado and Oregon. Europe and Asia.

Var. ELEGANS, Bab. Slender, 0.5–2.5 dm. high: spikelets 1 to 3, sessile or subsessile: longest bract of the dark involucre 0.5–1.5 cm. long. — Man. 333 (1843). *E. gracile*, Sm., Engl. Bot. xxxiv. t. 2402 (1812) and Engl. Fl. i. 69 (1824), not Koch. *E. angustifolium*, var. *alpinum*, Gaud., Fl. Helvet. i. 131 (1828). *E. angustifolium*, var. *minus*, Koch, Syn. 746 (1837); Engl. Bot. ed. Syme, x. 73, t. 1606 (1873). *E. pseudo-triquetrum*, Schur, Eu. 695 (1866). *E. minus*, Dalla-Torre, Atl. Alpenfl. 216 (1882). *E. polystachion*, var. *minus*, Richter, Pl. Eu. i. 136 (1890). *E. polystachyon*, var. *alpinum*, Aschers. & Graebn., Syn. ii. ab. 2, 334 (1903). — An extreme dwarf form of arctic and high-alpine regions. GRINNELL LAND (*A. W. Greely*): LABRADOR, Cape Chudleigh (*R. Bell*): ALASKA, St. Michaels (*L. M. Turner*). Arctic and alpine Europe.

++ ++ Midrib of the scale prominent, extending to the tip: leaves flat, except at the very tip; the sheaths and bracts not dark-girdled.

E. viridi-carinatum, n. comb. Culms slender, trigonous, smooth, 2–9 dm. high: basal leaves numerous, elongate; cauline few, remote, green throughout, thin, scabrous on the margins, the uppermost 5–15 cm. long, 2–6 mm. wide: involucral bracts 2

to 4, green throughout or brownish at base, the longest 3–9 cm. long: spikelets 3 to 30, on slender simple or forked minutely hairy peduncles (1–6 cm. long), in anthesis oblong-ovoid, 6–10 mm. long, in fruit 1.5–3 cm. long: scales greenish drab to lead color, ovate to lanceolate, 4–6 mm. long, the prominent often scabrous midrib extending quite to the tip, in the outermost sometimes prolonged as a short scabrous mucro; anthers linear-oblong, 1–1.25 mm. long: achenes oblong-obovoid, trigonous, 2.5–3.5 mm. long: bristles white or pale buff. — *E. polystachium*, Pursh, Fl. 58 (1814); Eaton, Man. 11 (1817); Torr. [*polystachyon*], Fl. 66 (1824); Beck, Bot. 427 (1833); Eaton & Wright, Bot. 237 (1840); Torr. [*polystachyum*], Fl. N. Y. ii. 359 (1843); Britton & Brown (*polystachyon*], Ill. Fl. i. 273 (1896), in part, incl. fig. 641; Small, Fl. 175 (1903). *E. latifolium*, *β. viridi-carinatum*, Engelm., Am., Jour. Sci. xlvi. 103 (1844). *E. polystachyon*, var. *latifolium*, Gray, Man. 529 (1848), not *E. latifolium*, Hoppe.— Bogs and wet meadows, Newfoundland to Saskatchewan and British Columbia, south to Connecticut, New York, Ohio, Michigan, Wisconsin, and said to follow the mountains to Georgia. Fruiting, southern New England, May and June; Gulf of St. Lawrence, July, August. Of the 70 sheets of specimens examined the following may be cited as typical. NEWFOUNDLAND, sphagnous swamps, near Topsail, Conception Bay, August, 1901 (*Howe & Lang*, nos. 1287, 1292): QUEBEC, peat-bogs, Salt Lake, Anticosti, August 10, 1883 (*J. Macoun*, Herb. Geol. Surv. Can., no. 32,273); Forteau, lat. 51°, July 31, 1882 (*J. A. Allen*, no. 13); arbor-vitae swamps, Carleton, July 24 & 27, 1904 (*Collins, Fernald & Pease*): NEW BRUNSWICK, Campellton, July 1, 1876 (*R. Chalmers*, Herb. Geol. Surv. Can. no. 32,271): NOVA SCOTIA, peat-bogs, Sydney Mines, July 14, 1883, bogs, Yarmouth, June 23, 1883 (*J Macoun*, Herb. Geol. Surv. Can., nos. 32,281, 32,261): ONTARIO, near Sarnia, June 5, 1892 (*C. K. Dodge*); bog, Casselman, June 12, 1892, and swamps, near Tetreauville, June 1, 1903 (*J. Macoun*, Herb. Geol. Surv. Can., nos. 32,267, 61,192): MANITOBA, tamarack swamp, near Sewell, June 12, 1896 (*J. Macoun*, Herb. Geol. Surv. Can., no. 16,389): SASKATCHEWAN, muskeag, Prince Albert, July 1, 1896 (*J. Macoun*, Herb. Geol. Surv. Can., no. 16,391): ALBERTA, bogs, Elbow River, July 12, 1897 (*J. Macoun*, Herb. Geol. Surv. Can., no. 25,329): BRITISH COLUMBIA, Kicking Horse Lakes, July 23, 1885 (*J. Macoun*, Herb. Geol. Surv. Can., no.

32,285): MAINE, larch swamps, St. Francis River, Aug. 13, 1902; swale, St. Francis, June 18, 1898 — no. 2085; marl, Fort Fairfield, June 22, 1898 — no. 2084; cedar swamp, Blaine, June 23, 1898 — no. 2083; wet meadows, Island Falls, June 10, 1898 — no. 2082; low woods and thickets, Dover, June 24, 1895 — no. 224 (all *M. L. Fernald*): NEW HAMPSHIRE, Flume, Franconia, June 29, 1855 (*Wm. Boott*); wet meadow, Crawford, July 1, 1898 (*E. F. Williams*): VERMONT, Manchester, July 5, 1898 (*M. A. Day*, no. 289): MASSACHUSETTS, Ashburnham, June 22, 1896 (*S. Harris*); vicinity of Boston, 1892 (*Biltmore Herb.*, no. 373a); open wet ground, Buckland, May 30, 1902 (*F. F. Forbes*); swale, Williamstown, May 31, 1898 (*J. R. Churchill*): RHODE ISLAND, North Providence, May, 1846 (*G. Thurber*); Morris Swamp, Providence, May 24, 1891 (*J. F. Collins*): CONNECTICUT, swamps, Southington, June 30, 1897 (*C. H. Bissell*, no. 708); Kent, June 3, 1894 (*C. K. Averill*): NEW YORK, western part of state (*A. Gray*, Gram & Cyp., no. 90); marsh near Utica, June 4, 1901 (*J. V. Haberer*, no. 1162): OHIO (*Sullivant*): MICHIGAN, swale, Keweenaw Co., August, 1888 (*O. A. Farwell*, no. 691); Port Huron (*C. K. Dodge*): WISCONSIN, Elkhart Lake, Green Bay, June, 1879 (*J. H. Schuette*).

Very unlike the European *Eriophorum latifolium*, Hoppe, which has the thin membranous dark scales with nerveless tips, and the bases of the involucre and the summits of the upper sheaths dark-girdled as in *E. polystachion.*

Var. **Fellowsii.** Spikelets all sessile or subsessile in a dense glomerule.— *E. polystachion*, var. *Vaillantii*, Fernald, Rhodora, iv. 82 (1902); Hoffmann, Rhodora, vi. 203; not Duby. — MAINE, Peaks Island, Portland Harbor, June 16, 1901 (*D. W. Fellows*): MASSACHUSETTS, Sheffield, June 1, 1902 (*M. L. Fernald*).

+ + Scales of the spikelets with several prominent ribs: stamen 1.

E. VIRGINICUM, L. Culms slender, wiry, terete below, trigonous above, smooth, 4–12 dm. high: leaves with close sheaths, elongate-linear, firm, scabrous on the margins, flat except at tip, the uppermost 1–2.5 dm. long, 1.5–4 mm. wide: involucral bracts 2 to 5, very unequal, somewhat divergent, the longest 4–12 cm. long: spikelets few to many, mostly crowded in a dense glomerule (1.5–6 cm. thick), in anthesis elliptic-ovoid, 6–10 mm. long, in fruit 1–2 cm. long: scales ovate-oblong, blunt or acutish, 3–5 mm. long, the strongly

striate-ribbed body greenish to straw-color, the thinner nerveless margin red-brown: anthers linear, 1.5 mm. long: achenes narrowly oblong, trigonous, attenuate below, abruptly short-beaked above, 3–4 mm. long: bristles tawny to copper color. —Sp. 52 (1753); Michx., Fl. i. 34 (1803); Pursh, Fl. i. 58 (1814); Ell. Sk. i. 92, t. 4, fig. 1 (1821) — uncharacteristic; Big., Fl. Bost. ed. 2, 24 (1824); Torr., Fl. 66 (1824), Ann. Lyc. Nat. Hist, N. Y. iii. 338 (1836), and Fl. N. Y. ii. 358 (1843); Gray, Man. 529 (1848); Britton & Brown, Ill. Fl. i. 273, fig. 643 (1896); Small, Fl. 175 (1903). *Eriophoropsis virginica*, Palla, Bot. Zeit. liv. ab. 1, 150, 151 (1896).— Bogs and meadows, Newfoundland to Ontario and Michigan, south to Georgia. Fruiting, July to September.

Var. ALBUM, Gray. Bristles whitish.— Man. ed. 5, 566 (1867); Britton & Brown, l. c.— A scarcely noteworthy extreme, Quebec and Ontario to Connecticut and New York.

(*To be continued.*)

PLANTS OF ONEIDA COUNTY, NEW YORK, AND VICINITY, — I.

J. V. Haberer, M. D.

In the latter part of July, 1904, the writer, in company with Mr. L. M. McCormick of New York, spent several days botanizing in the town of Forestport, which forms the northeastern corner of Oneida County. A number of rare and interesting plants were found including one recently described in Rhodora, therefore, the accompanying notes may be of interest to its readers.

The region visited is on the southwestern border of the great Adirondack wilderness, about forty miles north of Utica, and includes White, Otter, Round and Long Lakes, Deer Pond, mountainous woods, extensive beaver meadows or marl marshes, and sandy fields, all within a radius of three miles. A ridge of Archaean rock, extending from the northeast to the southwest, divides the region into two nearly equal portions. On the southeastern slope is White Lake, perfectly clear and transparent, and on the northwestern, the other

lakes, with the dark color characteristic of Adirondack waters. To the north and east, there is an unbounded stretch of mountains and woods, and to the south and west, a country that is, for the most part, much lower, flat, barren and sandy. The streams are rapid, and although flowing to the south, the drainage is into Lake Ontario through the Black River, the elevation of which at the ingress of these streams is about 1100 feet.

White Lake, the central point of observation, lies at an altitude of about 1450 feet above the sea level, and is in latitude 43° 32′ N., and longitude 75° 13′ W. of Greenwich. It is an intermediate station on the main artery of travel, that leads to the famous "North Woods" and John Brown Tract.

The flora of this portion of the county is similar to that of the adjacent Adirondacks,[1] in some respects it bears relationship to that of the Mohawk Valley,[2] and combines features common to both regions.

Forty years ago when Paine's Catalogue of the Plants of Oneida County and Vicinity[3] was published, the region in question was little known and almost inaccessible; therefore, the following list of plants with notes, includes only those (with few exceptions), that are additions to or admit of comparison with the record in that comprehensive work.

The asterisk (*) indicates plants not included in the Catalogue; the dagger (†) those included in that work, but with no definite record of their having been found in the county.

Specimens of many of the plants have been contributed to the Gray Herbarium at Harvard University, and the State Herbarium at Albany. Acknowledgments are due to Dr. B. L. Robinson, Mr. M. L. Fernald and Prof. C. H. Peck for assistance in the determination of doubtful plants. A number of plants are as yet undetermined, and a report of these and many others from different portions of Central New York must be deferred to subsequent issues of this Journal.

* Drosera rotundifolia, var. comosa Fernald, Rhodora, vii. 8. One of the first plants to attract our attention was a dwarf form of

[1] The altitude of Jock's (Honnedaga) Lake, the highest in the woods, is 2187 feet.

[2] The average elevation of Utica is 500 feet, and of the Mohawk river bank at this point 410 feet.

[3] 18th Rep. N. Y. Mus. Nat. Hist. 53–192. 1865.

sundew, with rounded leaves and "subcapitate inflorescences of few flowers." It was quite abundant in the marl marshes, and on the boggy margins of the lakes, alone, or in company with *Drosera rotundifolia* L., † *Juncus alpinus* Vill., and other plants; also on treacherous sloughs bordering Deer Pond, with, but outnumbered by † *Drosera intermedia* Hayne. Specimens were sent to the Gray Herbarium and Mr. Fernald very kindly identified them as being "exactly" the plant which he had "in print for the forthcoming January RHODORA." On consulting my herbarium I found that I had previously, July 11, 1902, collected immature specimens of this curious plant, on the marl margins of a Deer Pond (altitude 1950 ft.), near North Lake, Wilmurt, Herkimer County. The companion plants were *Drosera intermedia* Hayne, *Xyris montana* Ries, and the rare *Juncus stygius*, var. *Americanus* Buchenau! This evasive rush known in Somerset County, Maine, and mentioned by Mr. Fernald (RHODORA, vi. 41 and vii. 8), as growing in the Gaspé County bog, has a precarious existence in the State of New York. Perch Lake, Jefferson County, the station recorded in Paine's Catalog, 145, and the only one known for years, was destroyed long ago. The plant, however, was rediscovered in the State by Professor C. H. Peck, "on the marshy borders of a lake" in the Adirondacks (27 Rep. N. Y. Mus. Nat. Hist. 113). Dr. Peck very discreetly withheld the exact locality. He has lately informed the writer that it was in Essex County. Therefore, I am doubly fortunate in recording this plant in Herkimer County, and in the discovery of the unique sundew in a region far removed from the type locality.

* XYRIS MONTANA Ries. There was a luxuriant growth of this species on the borders of White Lake and along its outlet, at Round Lake, Deer Pond, and in the beaver meadows. In a peat bog immense patches were in full bloom July 23. The sight was a beautiful one, worth going miles to see, and was ample recompense for the inconvenience of a sudden downpour of rain. Amongst the myriads of plants, an occasional one was found in which the lowest scale of the flowering head was transformed into a bract 5–15 mm. long. It may be designated as forma **bracteosa**.

* XYRIS CAROLINIANA Walt. Common on the sandy and gravelly shores of White Lake, barely in flower on the above date and not detected elsewhere. An intermediate form with the leaves of *X. montana* and the heads of *X. Caroliniana* was common at White Lake,

and in a beaver meadow near Round Lake, fully as far advanced in flowering as the former species. *X. montana* has been found by Mr. W. E. Wolcott and the writer, at several stations in the vicinity of North Lake. Previous records of these plants in northern New York are very meagre. Paine (l. c. 146) mentions but one (*X. bulbosa* Kunth), and specimens of his *X. montana* and *X. flexuosa* from Herkimer County, are cited by H. Ries, Bull. Torr. Cl. xix. 35. Probably both species were collected on the "muddy edges" of ponds, on Bald Mountain, a long, narrow, rocky ridge nearly destitute of trees, north of Third Lake, one of the Fulton chain of lakes, Webb, North Herkimer County (altitude 2200 ft.). Paine's locality is ten to fifteen miles north of any that I have reported. It is of interest to note that these plants also have their habitats in the Hudson Valley and on Long Island (see Ries, l. c. 37, 38, 40, and Peck, Rep. xxii, 103).

† ELATINE AMERICANA Arnott. This plant was one of the delightful surprises of the trip — completely covering the sandy bottom, in the shallow clear waters of White Lake. Paine's record (l. c. 65) is Albany, *Beck*. Sand Lake and Averell Lake, Rensselaer County, are the stations for my specimens from C. H. Peck and J. H. Wibbe. I can find no record of the plant ever having been found before in this State, west of the valley of the Hudson.

* MICROSTYLIS OPHIOGLOSSOIDES Nutt. *Achroanthes unifolia* (Mx.) Raf. The most abundant orchid in the White Lake region, growing in thin soil on rocks, in woods, marshes and sandy fields, nearly always in the shade of *Pteris*. I first collected this plant July 8, 1903, on sandy bluffs (alt. 550 ft.), four miles west of Utica. Mr. I. W. Street reports it common at Brantingham Lake, Lewis County. The plant has hitherto been overlooked in Central New York and is not included in Mr. Homer D. House's list of the orchids (Torreya, iii. 49). Specimens are in the State Herbarium from Chenango County (*Coville*), and north Herkimer County (*Goodrich*).

HABENARIA GRANDIFLORA (Bigel.) Torr. The beautiful Soldier's Plume is occasional along White Lake outlet. It abounds in several forms on the headwaters of the Black River, near North Lake (alt. 1827 ft.). Paine (l. c. 126) found it west of Old Fort Bull, Rome (alt. 415 ft.). It is omitted from the list quoted above.

* CORALLORHIZA MULTIFLORA FLAVIDA Peck. On a shady knoll near White Lake. The plants were very yellow and the lip unspotted.

* Goodyera tessellata Lodd. Frequent in cold mountainous woods at Long and Otter Lakes; wooded slopes of Bald Mountain, August, 1895.

* Goodyera repens ophioides Fernald. Woods at Otter Lake. Mountain trail, Hardscrabble Lake (alt. 2050 ft.), Wilmurt; and in woods on Frankfort Hill (alt. 1400 ft.), Herkimer County. Near Oneida Lake (alt. 370 ft.), found there also by H. D. House (Torreya, iii. 165). Paine records several localities for *G. repens*. It grows in cold woods north of White Lake, on slopes of Bald Mountain, and ridges of ravines near Utica (alt. 900 ft.).

Lycopodium inundatum L. Abundant on the sandy and boggy margins of the Lakes, and in the beaver meadows. Opposite Utica in a sand bog (Fern Bull. ix. 88); east of the city in sandy fields. Bald Mt., and sand plains of Rome, also by Paine (l. c. 180–181), head of Oneida Lake, also by House (l. c. 166). The latter reports it at Ohio (Fern Bull. x. 16) (1370 ft.), and W. E. Wolcott at several stations near North Lake, all in Herkimer County. This record indicates a generous distribution especially in this region (Central Basin, see Fern Bull. xii. 97–105), famous for its large number of orchids and *Botrychia*. Utica is apparently the southern limit of the plant in Central New York. On the sandy shores of White Lake it was found well illustrating the fairy-ring like growth so interestingly described by Dr. B. L. Robinson, Rhodora, I. 28.

* Lycopodium clavatum monostachyon Grev. & Hook. Common on the shores of White Lake; mounds in a pasture near Taberg, Oneida Co., June 16, 1904. I first found this plant August 12, 1895, on the slopes of Bald Mountain (Fern Bull. xii. 104), where it was associated with *Carex leporina* L. (see Fernald, Proc. Am. Acad., xxxvii. 479, and Rhodora, iv. 229) and failed to realize the rarity of either plant. Prof. Peck has collected the former in Essex and Washington Counties.

* Lycopodium clavatum brevispicatum Peck (54th Rep. N. Y. Mus. Nat. Hist. 162). On rocky slopes near White Lake, a form of club moss was found that resembles Professor Peck's plant from Wallface Mountain. "The leaves of the branches are closely imbricated and strongly incurved, and the spikes are short, thick and generally very blunt."

* Botrychium matricariae Spreng. Fine specimens on a mossy

shaded bank at White Lake. Mr. B. D. Gilbert and the writer found a single plant on the Whitestown bluffs, in October, 1902, the station recorded for Microstylis, and it is of interest to note that Mr. Gilbert (Fern Bull. xii. 99) records this Botrychium from Lewis County.

(To be continued.)

CHLOROCHYTRIUM LEMNAE IN AMERICA.

Frank S. Collins.

Plants of the genus *Chlorochytrium* are of interest from their peculiar habitat and their special adaptations to the same. They are unicellular algae, and live in the tissues of higher, or at any rate larger organisms; not really as parasites, as they have well developed chromatophores and can assimilate their own nourishment; nor does it appear to be a case of symbiosis, as it is not easy to see what advantage their presence is to the host plants. Another point of interest is that *Chlorochytrium* is one of the relatively few genera represented both in salt and in fresh water; of the salt water forms three are known as American; *C. inclusum* Kjellm., in red algae at Greenland and from Alaska to Washington; the development of this species has been studied by Freeman[1]; *C. dermatocolax* Reinke, in *Chaetopteris* and *Sphacelaria* in Greenland; and *C. Schmitzii* Rosenv., in various loose tissued algae from Greenland to Maine. *C. Cohnii* Wright is found in *Enteromorpha* and some other algae, and in the gelatinous sheaths of such diatoms as *Schizonema*, along the New England coast; but this is now usually put in another genus, as *Chlorocystis Cohnii* (Wright) Reinhard. This species has been studied by Moore,[2] and the development well worked out.

Of the fresh water species the best known is *C. Lemnae* Cohn, which appears to be generally distributed in Europe, and whose development is quite well known. The host plant is *Lemna trisulca*

[1] E. M. Freeman, Observations on Chlorochytrium; Minn. Bot. Studies, Vol. II, p. 195. 1899.

[2] G. T. Moore, New or little known unicellular algae. I. Chlorocystis Cohnii; Bot. Gazette, Vol. XXX, p. 100, 1900.

L., which although apparently not common in America, certainly not in New England, is widely distributed, practically all over the United States. As most European fresh-water algae occur in America, there seemed to be reason to expect *C. Lemnae*, and by the kindness of Dr. B. L. Robinson, the writer was able to make an examination of the *Lemna trisulca* in the Gray herbarium. The result was satisfactory, as in the first specimen examined every frond contained many individuals of the *Chlorochytrium*, in various stages of development. The specimen was from Seabrook, New Hampshire, collected by Mr. A. A. Eaton, 18 July, 1896. That this species belongs in our flora is therefore certain, but that it is common is unlikely, for on examination of the other specimens, about twenty-five in all, from all parts of North America, not a single instance of the occurrence of the endophyte was found.

The cells of the *Chlorochytrium* show as relatively large, ovoid or ellipsoid, dark green bodies, between the cells of the host; they are to be detected only by microscopic examination, but are then seen easily with relatively low powers. When fully mature, the contents of the cell is transformed into numerous biciliate zoospores, of the usual ovoid form; the cells of the host plant have been pushed apart by the growth of the *Chlorochytrium* so that when the wall of the latter breaks, the zoospores pass out into the water, not free, but enclosed in a gelatinous vesicle; within this they conjugate, and the 4-ciliate zygote then escapes from the gelatine and swims freely for a while; then it comes to rest. Unless it settles upon a frond of *Lemna trisulca*, it perishes; but if attaching itself to this frond, it germinates, the pointed end, from which the cilia have fallen, pushing in between the cells of the host, till it reaches a comparatively open space, when it expands, and the protoplasm is drawn in, only a small button-like appendage remaining to show the point of entrance; the cell then grows to the full size, and zoospores are again formed.

There are several other endophytic algae found in Europe, whose development more or less resembles that of this species; a search for some of them was made in the Gray Herbarium, without results. An herbarium specimen is usually selected to show a plant in its best condition, while the endophytes usually do not reach their full development until the host has passed its prime; better success may be expected from an examination of living plants of the suspected hosts. The following European species have been well studied, and

can readily be identified. *Chlorochytrium Knyanum* Cohn & Szym., in *Lemna minor* L., *L. gibba* L., *Ceratophyllum demersum* L. and *Elodea Canadensis* Michx.; *Endosphaera biennis* Klebs in *Potamogeton lucens* L.; and *Phyllobium dimorphum* Klebs in *Lysimachia Nummularia* L., *Ajuga reptans* L., *Chlora serotina* Koch, and *Erythraea Centaurium* Pers. Undoubtedly many other species occur in other hosts, and there is quite a field here for a careful and persistent investigator.

MALDEN, MASSACHUSETTS.

DICKSONIA PILOSIUSCULA FORMA SCHIZOPHYLLA IN VERMONT. — Last August, while devoting myself most assiduously to the ferns of Dorset, Vermont, I brought in one day, two fronds of what I at first supposed to be a peculiar form of *Nephrodium spinulosum.* In the autumn I sent them with a number of others to Mr. Davenport, who pronounced them to be not *Nephrodium*, but a form of *Dicksonia*, found in Andover, Connecticut, in 1901, by Mr. A. Vincent Osmun of Amherst, and described by Mr. Clute in the Fern Bulletin for July, 1902, as *Dicksonia pilosiuscula*, forma *schizophylla.* I have compared the Dorset fronds with the type specimens at Amherst, and while these are larger, the peculiar texture and cutting are the same, and Mr. Osmun agrees in the determination. — EMILY HITCHCOCK TERRY, Northampton, Massachusetts.

THREE PLANTS NEW TO THE FLORA OF VERMONT. — There has long been a tradition that the Canadian Waterleaf (*Hydrophyllum canadense*, L.) grew in Williamstown, Massachusetts; and naturally it has been sought for upon the slopes and in the ravines of Greylock Mountain, where its congener *H. virginianum* is common. In RHODORA vi. 155, 156, Mr. Deane cites the frequent reports of its occurrence in western Massachusetts, and notes nevertheless the want of any existing specimens from New England to substantiate these reports. Since then Mr. Hoffmann has reported (RHODORA, vi. 205) his discovery of the plant near Greylock in Massachusetts in the summer of 1904; and Mr. Deane's prediction that "botanists will certainly visit that locality again, and the species will surely come to light before long," has been verified.

In June, 1904, the writer also had the pleasure of finding the plant in Pownal, in the State of Vermont. It was growing in rich low woods along the bank of a brook near the Hoosac River. Although on opposite sides of the line between the two States the two stations are not many miles apart. The town of Pownal is in the southwest corner of Vermont, and the discovery of this Waterleaf there confirms also the indefinite report of its collection in that part of the State by Robbins, in Thompson's History of Vermont, 1842, p. 192,[1] and the Canadian Waterleaf may now be definitely credited to the flora of both Massachusetts and Vermont on the authority of herbarium specimens.

Associated with the Waterleaf in the alluvial soil of the glen were Goldie's Fern (*Aspidium Goldianum*) and the Narrow Spleenwort (*Asplenium angustifolium*) ferns which are only "occasional" in the Vermont flora, and they made an attractive setting for the novel jewel in their midst.

In Vermont also, and new to the recently published List, are two Sedges. The first, *Carex trichocarpa*, Muhl., which is frequent along the Hoosac River in Williamstown, I traced down the river northward into Pownal, where it was growing in wet places, less abundantly than above. It is doubtless scattered along the river-bank still farther down.

Broad Brook is a beautiful stream which flows from the Green Hills of Pownal to the sluggish and muddy Hoosac. It was in rocky woods far up this brook that I found *Carex aestivalis*, M. A. Curtis. Specimens from both these collections are in my herbarium and President Brainerd of Middlebury has duplicates of the latter. — J. R. Churchill, Boston, Massachusetts.

[1] Referred to at the end of the Flora of Vermont; Dec., 1900, p. 106; and by Deane in Rhodora, vi. 184.

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TWO VARIETIES OF SISYMBRIUM OFFICINALE IN AMERICA.

B. L. Robinson.

Mr. J. C. Parlin has recently sent to the Gray Herbarium some specimens of the hedge-mustard, *Sisymbrium officinale*, Scop., calling attention to a striking difference in their color and pubescence. Mr. Fernald and I have examined these plants, as well as the available literature regarding the species, and find that there are in America, as well as in the Old World, two markedly different forms of *Sisymbrium officinale*, which were clearly recognized by the eldest DeCandolle, although for the most part undistinguished by subsequent authors. These are: —

S. officinale, Scop. Rather copiously pubescent on stem and leaves; the inflorescence and pods even at full maturity subtomentulose: whole plant grayish or bluish green. — Fl. Carn. ed 2, ii. 26 (1772); DC. Syst. ii. 459 (where extensive early synonymy is given); Reichenb. Ic. Fl. Germ. ii. t. 72 (1838); Fournier, Fam. des Crucif. 83 (1865); Ett. & Pok. Phys. Pl. Aust. ix. t. 857 (1873); Sowerb. Eng. Bot. ed. 3, 143, t. 94 (1873); Rusby, Mem. Torr. Bot. Club, iii. pt. 3, p. 5 (1893); Rouy & Foucaud, Fl. de Fr. ii. 19 (1895). *Erysimum officinale*, L. Sp. Pl. ii. 660 (1753). *Brassica adpressa*, Parish, Zoe. i. 57 (1890); Robinson, Syn. Fl. i. pt. 1, 134 (1895); not Boiss. — Europe, common. In America as follows: — Maine: waste ground, Brownville, 4 Aug. 1904, *J. C. Parlin*, no. 1756. California: Chico, May, 1878, *Mrs. J. Bidwell*; Elk Grove near Sacramento, 1884, *Rev. J. C. Nevin*, no. 926; streets of San Bernardino, April, 1886, *S. B. Parish*, no. 1772; a common weed, Berkley, 24 June, 1892, *J. W. Blankinship*. Bolivia: Cochabamba, *Bang*, no.

888 (distributed under a manuscript varietal name which, happily, does not appear to have been published).

Var. LEIOCARPUM, DC. Sparingly pubescent with stiffish slightly retrorse hairs; the inflorescence nearly smooth; pods entirely glabrous or with a few scattered hairs: plant inclining to yellowish green.— Syst. ii. 460 (1821); Guss. Fl. Sic. ii. 188 (1843); Fournier, Fam. des Crucif. 85 (1865); Rouy & Foucaud, Fl. Fr. ii. 20 (1895). *S. leiocarpum*, Jord. Diag. 139 (1864). *S. officinale* of nearly all American authors. *Erysimum officinale*, Pursh, Fl. Bor. Am. ii. 436 (1814).— Very common in North America (the original specimen from South Carolina). In the Old World rather rare, reported as follows:— Teneriffe according to DC. l. c.; Sicily, according to Guss. l. c. (an occurrence further proved by Todaro's no. 829 from Palermo); here and there in various parts of France and Corsica, according to Rouy & Foucaud, l. c.

These two forms of *Sisymbrium officinale* furnish an interesting parallel with *Chrysanthemum Leucanthemum* and its variety *subpinnatifidum*, described by Mr. Fernald (RHODORA, v. 181), and with *Lactuca Scariola* and its variety *integrata*, recently discussed by Mr. L. H. Dewey (RHODORA, vii. 9–12). In each instance the typical form of the species (by which I mean here only that form which was first characterized) is a plant widely distributed and abundant in the Old World, but rare, local, and probably of rather recent introduction in America, while the varieties, although relatively rare in the Old World have taken a firm hold in America and are now widely distributed on this continent as pernicious weeds.

It is evident that the typical form of *Sisymbrium officinale* in its American occurrence is as yet chiefly established in California, where the variety, so common in other parts of the United States, appears to be rather rare.

The variety *leiocarpum* is so readily distinguished that there will be a temptation on the part of many to consider it distinct, as did Jordan. But it has been impossible as yet to correlate with the difference of pubescence any other clear or constant distinction. There is, it is true, a general tendency in the smoother form to have more slender pods and a slightly longer style. These differences, however, are by no means constant and the other distinctions of leaf-contour, length of seed, etc., mentioned by Jordan, are quite as often reversed as true in the sense in which he applied them.

By way of summary it may be said that our common hedge-mustard, having smoothish inflorescence and essentially glabrous pods, should be called *Sisymbrium officinale*, var. *leiocarpum*, DC., while the typical hairy-podded form, hitherto chiefly European in its distribution, proves to have been some years established in California and has now been found in Maine. It is therefore likely to be found elsewhere in our country.

Gray Herbarium.

TWO FERNS NEW TO THE FLORA OF VERMONT.

Clarabel Gilman.

The western half of Vermont is known as the home of rare and beautiful ferns, which grow among the mountains and upon the limestone rocks; but the portion east of the Green Mountains is not to be scorned by the student who delights in large and fine plants of the commoner ferns, as well as in new specimens of the rarer species. It was my good fortune last summer to find in the woods and on the hillsides of the town of Chester, Vermont, many unusually fine plants of some of the larger ferns, such as *Nephrodium spinulosum* and its variety *intermedium*, *Nephrodium Noveboracense*, *Athyrium filix-foemina* and *thelypteroides*, *Polystichum acrostichoides*, *Nephrodium marginale*, and *Struthiopteris Germanica*. *Woodsia Ilvensis*, *Asplenium ebeneum* and *Trichomanes*, and *Adiantum pedatum* are also among the natives of this region. Some fine specimens of *Botrychium lanceolatum* were gathered in a moist hollow on a hillside. Of course the common ferns of meadow, swamp, and pasture are found in Chester, as in most parts of New England. In all, 25 species and 6 varieties were gathered. But the special finds of the season were two varieties, one of which, so far as I have been able to learn, has not been previously reported in Vermont, and the other not in New England.

The first of these is Mr. Gilbert's variety *fructuosum* of *Nephrodium spinulosum*. The plants were first found August 18th. They grew around the base of a rock on the edge of a fine maple grove, and at once attracted attention by their richness and luxuriance of growth

and the unusual size of the fronds. The heavily fruited frond which was taken for pressing, when carefully examined, revealed glandular indusia covering the fruit-dots, but was so thick and heavy with its crowded pinnae that it could not be considered the variety *intermedium.* On referring to Waters's *Ferns*, it was found to correspond in all essential points with the description of the variety *fructuosum*, the principal part of which I quote: "Closely related to it (*N. spinulosum dilatatum*) is one more variety that has rather large sori, with glandular indusia, that form two lines on the smaller pinnules or on the lobes of the larger ones. The fronds are tripinnate below, bipinnate above. The stipes, which are one-third to one-half the entire length, are clothed sparingly with pale-brown ovate scales. . . . . This has been called variety *fructuosum* on account of the numerous sori." Dr. Robinson has since compared the fern with the forms of *N. spinulosum* in the Gray Herbarium, and has verified my identification of it as var. *fructuosum.* Waters says: "So far it has been collected only in New York and Connecticut, but it may prove to be of much wider range."[1]

Believing, then, that a careful search may bring it to light in other New England states, I think it worth the while to compare it more in detail with the type and the two more common varieties. It is distinguished from the type form of *N. spinulosum* by the greater length of the lower pinnae, the larger sori, and the glandular indusia. Moreover,. while the pinnae are not set more closely upon the rachis, the greater length of the pinnules throughout nearly the whole frond causes the pinnae to overlap and produces the appearance of crowding.

Again, while the general outline of the frond is much like that of the variety *intermedium*, especially the unusually long and broad form of *intermedium* sometimes found, it is distinctly heavier and closer, and has thinner, paler brown scales on the stipe.

The new fern, however, is much more likely to be confused with the variety *dilatatum*, especially the forms of the latter with lengthened fronds. As in var. *dilatatum*, the pinnae are very broad and finely taper-pointed, and the lowest pair have the pinnules on the lower side considerably longer in proportion to those on the upper

[1] Since writing the above I have read in *The Plant World* for February, 1905, that this variety was collected by Dr. Waters at McCall's Ferry, Pennsylvania, during the Botanical Symposium held there last July.

side than in other forms of *N. spinulosum*, but the pinnae overlap more than in most, if not all, of the specimens of var. *dilatatum* that I have seen. Moreover, the glandular indusia and the very thin, pale brown scales are distingushing marks.

The other new fern, which is, however, much easier to recognize, is *Botrychium obliquum*, var. *Oneidense*, which, according to Waters, has been found before only in central New York, in the Catskills, and near Washington. It was growing in damp woods, like the typical form, but attracted notice by its blunter, clumsier appearance. It has shorter segments with fewer lobes, which are strongly rounded at the ends. The lower pinnae have each three pairs of these lobes besides a larger terminal one. The lobes look entire unless closely examined, when they are seen to be very faintly toothed. Only one plant was found, and of this only the sterile portion.

Jamaica Plain, Massachusetts.

PARTHENOGENESIS IN ANTENNARIA.

R. G. Leavitt and L. J. Spalding.

We have observed every necessary step in the formation of embryos directly from egg-cells without fertilization in *Antennaria fallax* and *A. neodioica*. The flowers were carefully netted at a young stage and thus until the fruit was ripe were protected from pollen which might be brought from allied species or by a rare chance from the almost unknown male plants of the same species, either by insects or by winds. Microtome sections showed normal embryo-sacs and egg-apparatus and subsequent steps in the development of the embryo and endosperm; but no pollen tubes and no spermatic nuclei were seen. Details with drawings will be published later. Two other species under test conditions have shown embryo-formation, namely *A. canadensis* and *A. Parlinii*. Inasmuch as two American and one European species of *Antennaria* have now been shown to be parthenogenetic, the last named two may be assumed to behave in the same way; but this will soon be a matter of careful determination by us.

The Ames Botanical Laboratory,
North Easton, Massachusetts.

PLANTS OF ONEIDA COUNTY, NEW YORK, AND VICINITY,— I.

J. V. Haberer, M. D.

(*Continued from page 97.*)

† Festuca ovina L., which the same observer (l. c. 161) reports as occurring "sparingly on Wallface," was abundant on barren hills.

† Agrostis Novae-Angliae Tuckm. Found on the rocky ridge, contesting the ground with King Devil. Bald Mountain, August, 1895 (determined by Scribner and Merrill), also reported there by Paine (l. c. 166)

† Rhynchospora fusca R. & S. Boggy margins of Otter, Round and White Lakes, Deer Pond beaver meadow. Paine reports it in the "North Woods." There are several stations for the plant in the towns of Wilmurt, Herkimer County; Morehouse and Arietta, Hamilton County.

† Rhynchospora glomerata Vahl. The only locality mentioned by Paine (l. c. 150) is Bald Mountain. The plant is abundant throughout the White Lake region. Common along Moose River, Lyons Falls, Lewis Co., Sacandaga River, Northville, Fulton Co. (alt. 800 ft.), and the West Canada Creek at East Herkimer (alt. 410 ft.). At the latter locality it was found July 8 and 14, 1904, on the gravelly flats of the stream in company with **Juncus brevicaudatus* Fernald., *Juncus filiformis* L., *Deschampsia caespitosa* (L.) Beauv., *Andropogon furcatus* Muhl.,* *Physalis heterophylla nyctaginea* Rydb., *Lysimachia vulgaris*, L., * *Limnorchis media* Rydb., *Spiranthes* (*Gyrostachys*) *plantaginea* Raf., *Spiranthes* (*Gyrostachys*) *gracilis* Bigel. (also at Deer Pond), and * *Equisetum variegatum Nelsoni* A. A. Eaton. This station for the latter is I believe the only one known in the State (Fern Bull. xii. 41). Simulates forms of *E. litorale.*

* Scirpus rubrotinctus Fernald. Common in beaver meadows. Abundant in many localities in the Mohawk Valley and Adirondacks. Greedily devoured by cattle.

Scirpus subterminalis Torr. Abundant *in* rapid streams, the typical aquatic plant quite in contrast to the variety *terrestris* Paine, which grows *on* a quaking morass in Litchfield, Herkimer County. Paine's (l. c. 148) single locality (for the species) in the county,

North Pond, is about ten miles south of White Lake. It is common in the Adirondacks.

† CAREX NOVAE-ANGLIAE Schw. In sandy soil on the border of a beaver meadow near the railroad station. (*Eriophorum alpinum* L., was found in the same meadow.) This Carex fairly carpets the ground in many sandy localities about North Lake, Atwell, N. Y. In the lamented Dr. Howe's admirable "New York species of Carex" (48 Rep. N. Y. Mus. Nat. Hist. 78), it is ascribed only to Rensselaer County, and in Paine (l. c. 155) to the Mt. Marcy region on the authority of Dewey and Knieskern. Reported from western New York.

* CAREX MIRABILIS PERLONGA Fernald. Frequent on the rocky ridge. Banks of Sacandaga river, Fulton Co. Rocks, north side of the Mohawk at Little Falls.

* CAREX SCOPARIA CONDENSA Fernald. Common on the rocky ridge. Slopes of Bald Mountain. Jefferson County, *Crawe.*

* CAREX VESICARIA JEJUNA Fernald. Shallow waters of Round Lake and Deer Pond. North Lake and vicinity. Sand Lake and Raquette Falls specimens are cited by Mr. Fernald, RHODORA, iii. 53.

† SALIX CANDIDA Fluegge. Beaver meadows at Deer Pond and near the railroad. These stations are fully fifty miles north of the cold elevated marshes of South Herkimer County where the plant is common. Also recorded there by Paine (l. c. 128).

* CALLITRICHE HETEROPHYLLA Ph. Plentiful in White Lake outlet and the confluent stream of the other lakes, Cuming's Creek. *C. verna* L., is the prevailing species in the Mohawk Valley.

† PODOSTEMON CERATOPHYLLUM Mx. Frequent on stones in the rapid waters of White Lake outlet. Hitherto known only in Jefferson County. (Record in Catalogue, 123.)

† MYRIOPHYLLUM HETEROPHYLLUM Mx.? Rather common in Long Lake, also a terrestrial form on low muddy shores. Irondequoit Bay, *Booth* in Catalogue, 81.

* UTRICULARIA RESUPINATA B. D. Greene. Single flowering specimen in mossy sloughs at Long Lake. "North Woods," *B. D. Gilbert.* The genus was well represented, *U. cornuta* Mx., † *U. minor* L., † *U. intermedia* Hayne and *U. vulgaris* L., were common in beaver meadows, the first mentioned in full bloom, in abundance, was like unto a field of low buttercups. These four species are

closely associated on Hidden Lake, Litchfield, Herkimer County. (Long Lake was probably a botanical paradise in its day, but the axe and forest fires have left it a barren waste.)

Pontederia cordata L. A single plant of the pinkish-white flowered form at Long Lake, reminded us of a similar colony (known also to the late Father Wibbe), on the gravelly shores of Oneida Lake, South Bay, Madison County. Found in western New York by Mr. Geo. Miner. Bull. Torr. Cl. 1877.

* Ilex verticillata cyclophylla Robinson., a well marked plant (little known and rarely collected), is abundant on the boggy margins of Otter Lake. A similar plant was found near Long and White Lakes.

* Vaccinium Pennsylvanicum angustifolium Gray. Common at Long Lake. Abundant on rocks, north side of the Mohawk at Little Falls. Adirondacks.

Viola lanceolata L. Paine's (l. c. 62) single locality in the county is Clinton on the authority of Bradley. My first and only collection of this plant (fruiting specimens) was made at White Lake, where the plant is common on sandy and gravelly shores. Near Syracuse, *H. D. House* (Torreya, ii. 68).

* Solidago macrophylla Ph. Rocky ridge at White Lake. Cliffs, Trenton Falls. Common in the Adirondacks.

Corydalis glauca Ph. This plant grows on the rocky ridge north of White Lake, also on Bald Mountain and at Little Falls *both* sides of the Mohawk. Reported also by Paine (l. c. 59) in the two latter localities. The rocks are identical.

* Lychnis Chalcedonica L. and † Phlox paniculata L. An extraordinary growth of these plants was found on a densely wooded slope, perhaps survivals of an old logging camp.

* Hieracium aurantiacum L., and * Hieracium praealtum L., vile weeds throughout the region, as well as central New York, were unknown to American botany when the Catalogue was published.

* Arceuthobium pusillum Peck. (*Razoumofskya pusilla* (Peck) Kuntze.) Over twenty years ago (Bull. Torr. Cl. ix. 33) I reported this plant as growing on *Picea Mariana* B. S. P. (*P. nigra* Link.), in the sphagnum marshes on the heights of Frankfort and Graefenberg (alt. 1300 ft.), Herkimer County, within two miles of the Oneida–Herkimer Co. line and five miles from Utica. Persistent search throughout Oneida County, at last revealed the dwarf mistletoe within

its borders, for it was found on July 24 last in abundance on black (stunted) spruce trees near Long Lake, Forestport! It was the crowning find of a very successful and enjoyable botanical trip.

Several species of *Amelanchier* were very abundant in the White Lake region and shad-berry pie was a *common* dessert at the Lake House.

I know of no better place to report the following plant, hitherto unknown in central New York.

Carex albicans Willd. (*C. Peckii* Howe.) Wooded banks of the West Canada Creek below Trenton Falls, on the east side of the stream; Russia, Herkimer County (alt. 650 ft.). Found June 13, 1904. Previously ascribed to Albany, Jefferson, Cayuga and Yates counties. Included in Catalog, 155, with notes by Knieskern and F. Boott, and cited at Penn Yan and Rochester by Dewey. I expect to find it in Oneida County.

* The following is a partial list of the plants found, that were unrecognized as species and varieties when the Catalog was published. Those printed in *italics* are known to the writer as occurring also in the Adirondacks, while those preceded by a dash occur southward. The others are of general distribution.

Sparganium fluctuans Robinson.
— Panicum unciphyllum Trin.
Danthonia compressa Aust.
Scirpus pedicellatus Fernald.
S. atrocinctus brachypodus Fernald.
Eriophorum tenellum Nutt.
— Carex intumescens Fernaldii Bailey.
C. Baileyi Britton.
— C. debilis strictior Bailey.
C. stellulata cephalantha Fernald.
C. stellulata excelsior Fernald.
C. stellulata angustata Carey.
— C. interior capillacea Bailey.
C. canescens disjuncta Fernald.
C. canescens subloliacea Laest.
C. Crawfordii Fernald.
C. tribuloides reducta Bailey.
C. Bebbii Olney.
— C. foenea perplexa Bailey.
— Juncus tenuis anthelatus Wieg.
J. Dudleyi Wiegand.
J. brevicaudatus Fernald.
Nymphaea hybrida Peck.
Spiraea latifolia Borkh.
Rubus nigricans Rydb.
Amelanchier spicata Dec.
— Hypericum maculatum subpetiolatum Bick.
H. boreale Bick.
Epilobium adenocaulon Haussk.
Vaccinium Oxycoccus intermedium Gray.
Azalea canescens Michx.
Gentiana rubricaulis Schw.[1]
— Lycopus uniflorus Michx.
Galium Labradoricum Wiegand.

[1] Credited to Paine, Herkimer Co. by Gray, Syn. Fl. ii. pt. 1, 123.

The following is an additional list of plants that were included in the Catalog but with no definite record of their having been found in the County. The type and signs have the same signification as in the preceding list.

Sporobolus serotinus Gray.
Scirpus atrocinctus Fernald.
Carex Michauxiana Boeckl.
C. rostrata Stokes.
— *C. lenticularis* Michx. (Trenton Falls.)
C. viridula Michx.
Alnus mollis Fernald (as *A. viridis*).
Betula papyrifera Marsh.
Myrica Gale L.
Spiraea tomentosa L.
Gentiana linearis Froel.
Hypericum ellipticum Hook.
Galium Claytoni Michx.
Lobelia Dortmanna L.

A long list of plants could be given that are more or less interesting to close observers of plant distribution. A few of them are *Pellaea gracilis* Hook., *Asplenium Trichomanes* L., *Sparganium angustifolium* Michx., *Scheuchzeria palustris* L., *Sagittaria graminea* Michx., *Carex pauciflora* Lightf., *C. oligosperma* Michx., *C. chordorhiza* Ehrh., *Eriocaulon septangulare* With., *Juncus filiformis* L., *Juncus pelocarpus* E. Meyer., *Spiranthes gracilis* Big. (single plant), *Brasenia purpurea* Casp., *Dalibarda repens* L., *Epilobium lineare* Muhl., *Andromeda glaucophylla* Link., *Epigaea repens* L., *Kalmia angustifolia* L., *Linnaea borealis* Gronov. and *Limnanthemum lacunosum* Griseb.

A number of unsettled genera such as *Viola* and *Antennaria* can be better noted from other sections of the county. The orchids now number forty in Oneida County and forty-two species and varieties in Herkimer County. The writer is confident that further explorations in the White Lake region, at an earlier and later season will reveal additional plants, hitherto unknown in a county which is exceedingly luxuriant in its vegetation and has rather Canadian than Alleghanian flora.

Utica, N. Y.

Silene conica in New England. — Several specimens of *Silene conica*, L., were found by me, June, 1904, in Dartmouth, Massachusetts, in a field newly laid down to grass. A considerable quantity of French clover, *Trifolium incarnatum*, Willd., was also noticed in the same field. — E. Williams Hervey, New Bedford, Massachusetts.

A CONTRIBUTION TO THE DESMID FLORA OF NEW HAMPSHIRE.

Joseph A. Cushman.

(Plate 61.)

Although New Hampshire contains the greater part of what may be called the mountain region of New England, with the highest elevations of land and great numbers of ponds and lakes, its Desmid flora has hardly been touched on. By the natural conditions of alpine summits and valley lakes a considerable number of species would naturally be expected. In the present paper it is believed that all previous records are included. These records are as follows: a few species collected by Lewis at Saco Lake and reported in Wood's Fresh Water Algae of the United States; a short list of about a dozen species from Hanover recorded by Edwards in the Geology of New Hampshire; a very few records in Wolle's Desmids of the United States; a few records from about Rochester by Hastings; a few records by L. N. Johnson; a number of records and descriptions of new species by W. & G. S. West, these being largely from the notes of L. N. Johnson.

During the last three years the writer has obtained a considerable amount of New Hampshire material. This consists of the following: very rich collections from Pudding Pond, North Conway and from Intervale, consisting of Utricularia and an abundance of Desmids, collected by Dr. Glover M. Allen; collections from North Woodstock and Mt. Moosilauke (3000 and 4000 ft. altitude) collected by Warren A. Priest; several lots of material from about North Woodstock, collected by George A. Fisher; material from Squam Lake, collected by Herman Gammons; and lastly material from Noone's Station, obtained from dried Utricularia specimens in the Gray Herbarium collected by Dr. B. L. Robinson (no. 473).

The material of L. N. Johnson, which was reported by slide numbers and which is now in the Cryptogamic Herbarium of Harvard University, has been examined by the writer through the kindness of Drs. Farlow and Thaxter. Those which were located are marked with an exclamation point (!) as well as all the other records for which specimens were seen by the writer.

As the material from North Conway and Intervale was taken from ponds, which are in direct water connection with that from which Wood's specimens were obtained, it is not surprising to find nearly if not all of his recorded species appearing from these two localities.

Nearly all of Prof. Bailey's species have also turned up in this material. As access has been had to his original notes and drawings, certain critical notes are appended to those species, as the published figures were as a rule poor, while the originals were careful camera drawings.

Certain of the names and genera used by Wolle in his Desmids of the United States need revision and for the species touched upon this has been roughly indicated. In the arrangement of the genera the writer has followed that given in W. & G. S. West's British Desmidiaceæ with slight differences, these last conforming more closely with Wille's classification in Engler and Prantl. My thanks are due to Dr. O. Borge of Stockholm, Sweden, for helpful suggestions especially as to certain of the forms here published as new. Species new to the New England list are preceded by an asterisk.

The abbreviations H. J. and H. C. indicate that the specimens are preserved in the herbarium of L. N. Johnson and of the writer respectively.

Gonatozygon DeBary.

G. monotaenium DeBary. (*G. asperum*, Wolle '92: *G. Ralfsii* DeBary.) Length 260 μ: breadth 11 μ. Pudding Pond, North Conway, rare! Holderness, scarce (*Wests*).

G. Brebissonii DeBary. (*G. Ralfsii*, Johnson '95). Length 136–160 μ: breadth 6–8 μ. Laconia (*Wests*).

G. aculeatum Hastings. Breadth with spines 40 μ, without spines 20 μ. Pennichuck Pond, Nashua (*Hastings*). Laconia, frequent (*Wests*). Meredith, occasional (*Johnson*).

Spirotaenia Bréb.

S. condensata Bréb. Length 122 μ: breadth 18 μ. Pudding Pond, North Conway, frequent!

Mesotaenium Näg.

M. macrococcum (Kütz.) Roy & Biss. (*M. Braunii*, Wolle '92). Reported from the Flume (*F. S. Collins*).

M. Endlicherianum Näg. Length 25 μ: breadth 8 μ. Intervale, frequent!

Cylindrocystis Menegh.

C. Brebissonii Menegh. (*Penium Brebissonii*, Wolle '92). Var. minor W. & G. S. West. New to U. S. (Herbarium of Jos. A. Cushman, no. 112.) Length 28 μ: breadth 13 μ. Intervale, frequent!

C. crassa DeBary. (*Penium crassa*, Wolle '92.) Length 40 μ: breadth 20 μ. Mt. Moosilauke, abundant!

C. diplospora Lund. (*Calocylindricus diplospora*, Wolle '92.) Length 48–61 μ: breadth 27–32 μ: isthmus 23–28 μ. Intervale, frequent!

* C. Americanum W. & G. S. West. Var. **minor** var. nov. While specimens from Colorado agreed almost exactly with the types from New York, these specimens from New Hampshire and those from Newfoundland were considerably smaller and the variation seems to be constant. Length 34–40 μ: breadth 16–18 μ. Mt. Moosilauke! (H. C. no. 80.)

Netrium Näg.

N. Digitus (Ehrenb.) Itzigs. & Rothe. (*Penium Digitus* and *Penium lamellosum*, Wolle '92.) Length 200–280 μ: breadth 62–78 μ. Pudding Pond, North Conway! Intervale! Mt. Moosilauke, abundant! Saco Lake (*Wood*).

N. oblongum (DeBary) Lütkem. (*Penium oblongum*, Wolle '92.) Length 96 μ: breadth 29 μ. Intervale!

* Var. cylindricum W. & G. S. West. New to U. S. (H. C. no. 78.) Length 60–71 μ: breadth 18–20 μ. Mt. Moosilauke, abundant!

* Forma **major** (Turner) forma nov. Length 168 μ: breadth 44 μ. Pudding Pond, North Conway, frequent!

N. interruptum (Bréb.) Lütkem. (*Penium interruptum*, Wolle '92.) Length 172–320 μ: breadth 38–40 μ. Intervale, scarce!

Penium Bréb.

P. Libellula (Focke) Nordst. (*P. closterioides*, Wolle '92.) Length 233–320 μ: breadth 38–50 μ. Intervale, scarce! Pudding Pond, North Conway, common! North Woodstock, common!

* Var. interruptum W. & G. S. West. New to U. S. (H. C. no. 116.) Length 120 μ: breadth 22 μ. Pudding Pond, North Conway!

P. margaritaceum (Ehrenb.) Bréb. Length 150 μ: breadth 22 μ. Intervale! Pudding Pond, North Conway! Plymouth (*Wests*). Their specimens did not show the linear arrangement of the markings.

P. polymorphum Perty. Length 50 μ: breadth 20 μ. Pudding Pond, North Conway, occasional!

P. minutum (Ralfs) Cleve. (*Docidium minutum*, *Penium minutum*, *Calocylindus minutum*, Wolle '92.)

* Var. elongatum W. & G. S. West. Length 372 μ: breadth 9 μ. Variety new to United States. (H. C. no. 115.) Pudding Pond, North Conway!

Roya W. & G. S. West.

R. obtusa (Bréb.) W. & G. S. West. (*Closterium obtusum*, Wolle '92.) Length 150 μ: breadth 15 μ. Pudding Pond, North Conway!

Closterium Nitzsch.

* C. Cynthia DeNot. Length 140 μ: breadth 15.5 μ. North Woodstock!

C. didymotocum Corda. Length 400–403 μ: breadth 25–34 μ: apices 13 μ. Intervale, common! Mt. Moosilauke!

C. macilentum Bréb. Length 527 μ: breadth 15.5 μ: apices 6 μ. Intervale!

* Forma intermedium Racib. Form new to U. S. (H. C. no. 114.) Length 200 μ: breadth 8.5 μ: apices 5 μ. Pudding Pond, North Conway!

C. angustatum Kütz. Var. clavatum Hastings. Length 650 μ: breadth 28 μ: apices 16 μ. North Woodstock! Rochester (*Hastings*). Saco Pond (*Wood*). Hanover (*Edwards*).

C. costatum Corda. Length 340–410 μ: breadth 38–44 μ. Pudding Pond, North Conway!

* Var. **Westii** var. nov. (*C. costatum*, forma: W. & G. S. West: Trans. Linn. Soc. Lond. (Bot.) v. 237. t. XIII, f. 23, 24). Length 230–300 μ: breadth 25–32 μ: apices 10–12 μ. Cells only slightly

curved, tumid in the middle, apices truncate: membrane punctate between the striae: smaller than the typical form of the species. North Woodstock! (H. C. no. 189.)

* C. REGULARE Bréb. Length 250 μ: breadth 37 μ: apices 8 μ. New to U. S. (H. C. no. 107.) Intervale!

C. STRIOLATUM Ehrenb. Length 332 μ: breadth 37 μ: apices 12.4 μ. Saco Pond (*Wood*). Meredith (*Wests*). Plymouth (*Wests*) (H. J. no. 382)!

VAR. INTERMEDIUM (Ralfs) Jacobs. Length 245 μ: breadth 34 μ. Intervale!

* VAR. ELONGATUM Rab. Length 400 μ: breadth, 25 μ. Intervale!

* VAR. ERECTUM Klebs. Length 360 μ: breadth 34 μ. (H. C. no. 187.) North Woodstock!

* **Closterium intervalicola** sp. nov. (PLATE 61, FIG. 1.) Length 168 μ: breadth 15.5 μ: apices 6 μ. Small Closterium with the median portion nearly straight, but with the ends decidedly curved: apices squarely truncated: about six visible striae: cell wall of a light yellowish color in empty cells. Intervale! (H. C. no. 104.)

C. JUNCIDUM Ralfs. Length 320–375 μ: breadth 6–8.5 μ: apices 3.5 μ. Pudding Pond, North Conway! Saco Lake (*Wood*).

C. DIANAE Ehrenb. Length 325 μ: breadth 25 μ. Pudding Pond, North Conway!

C. PARVULUM Näg. Length 108–170 μ: breadth 10–13 μ: apices 1.5–2.5 μ. Pudding Pond, North Conway!

* C. INCURVUM Bréb. Length 68 μ: breadth 12 μ. New to U. S. (H. C. no. 101.) Intervale!

C. VENUS Kütz. Length 72–75 μ: breadth 9–10 μ. Bog near Noone's Station! Mt. Moosilauke, common!

* C. CALOSPORUM Wittr. Length 108 μ: breadth 10 μ. Pudding Pond, North Conway!

C. ACUMINATUM Kütz. Length 325–360 μ: breadth 25–31 μ. Pudding Pond, North Conway!

C. MONILIFERUM (Bory.) Ehrenb. Length 265 μ: breadth 40 μ. Intervale!

C. EHRENBERGII Menegh. (*C. robustum* Hastings.) Length 400 480 μ: breadth 100–120 μ. Page Brook, Rochester (*Hastings*).

C. ACEROSUM (Schrank.) Ehrenb. Length 450 μ: breadth 38 μ. Intervale!

C. Lunula (Müll.) Nitzsch. Length 510–530 μ: breadth 71–90 μ. North Woodstock! Pudding Pond, North Conway, common!

* Forma minor W. & G. S. West. Length 403 μ: breadth 56 μ. Intervale!

C. Johnsonii W. & G. S. West. Length 357 μ: breadth 12 μ: apices 12 μ. Plymouth (H. J. no. 655)! On examining the type of this species its closeness to *C. didymotocum* was at once noticed. The sigmoid character of the specimen may be due to the mounting of it as but one semicell seems to give this character. The apices have the dark brown annular thickening characteristic of *C. didymotocum*. It is however somewhat more attenuated than the ordinary forms of that species.

C. tumidum Johnson. Length 130–150 μ: breadth 15–18 μ. Pudding Pond, North Conway! Holderness, frequent (*Johnson*).

C. attenuatum *Ehrenb.* Length 465 μ: breadth 45 μ. Pudding Pond, North Conway!

C. turgidum Ehrenb. * Forma **intermedium** forma nov. Length 400 μ: breadth 28 μ: apices 7–9 μ. Smaller by one half or one third than the typical form. Intervale! (H. C. no. 110).

C. Braunii Reinsch. (*C. maculatum* Hastings. *C. areolatum* Wood.) Breadth 25–30 μ. Rochester (Hastings).

C. pronum Bréb. Length 320–375 μ: breadth 6–8.5 μ. Pudding Pond, North Conway!

C. lineatum Ehrenb. var. costatum Wolle. Rochester (Wolle).

C. Ralfsii Bréb. var. hybridum Rab. Length 540–575 μ: breadth 40–63 μ: apices 10.5–11 μ. Pudding Pond, North Conway! Moore's Station!

C. decorum Bréb. Length 510–540 μ: breadth 25–48 μ: apices 6–9 μ. Pudding Pond, North Conway! North Woodstock!

C. Kuetzingii Bréb. Length 420–450 μ: breadth 22 μ: apices 3 μ. Pudding Pond, North Conway!

C. setaceum Ehrenb. Length 400–465 μ: breadth, 10 μ: apices 1–2 μ. Pudding Pond, North Conway!

Docidium (Bréb.) Lund.

* D. undulatum Bail. (*D. dilatatum*, Wolle '92.)

* Forma perundulatum W. & G. S. West (Plate 61, figs. 2, 3). Length 223–330 μ: breadth at base 12–12.5 μ: at apices 12.5–13 μ.

Intervale! Pudding Pond, North Conway! There are no plications at the apices in these specimens nor in the series which have been seen from Florida and Cuba. In looking up Bailey's original drawings, several of this species were found. But one of these had the plicated apices. This was evidently an unfortunate publication of this figure as the type figure, as it did not truly represent the species. Wolle's figure of *D. dilatum* represents a typical *D. undulatum.*

Pleurotaenium Näg.

P. coronatum (Bréb.) Rab. (*Docidium coronatum*, Wolle '92.) Length 480–580 μ: breadth at base 56–63 μ: apices 34–40 μ. Pudding Pond, North Conway! Noone's Station!

* Var. fluctuatum West. Length 900 μ: breadth at base 65 μ: at apex 46 μ. Variety new to U. S. (H. C. no. 105.) Intervale!

* **P. subgeorgicum** sp. nov. (Plate 61, fig. 4). *Pleurotaenium* of much the same type as *P. Georgicum* Lagerh. but one third smaller, a crown of ten bluntly rounded spines at the apex, four or five undulations at the basal portion, ends of the semi-cell much narrower than the middle. Length 651 μ; breadth at base 31 μ; at middle of semicell 50 μ; at apex 28 μ. North Woodstock! (H. C. no. 188.)

P. Ehrenbergii (Bréb.) DeBary.

* Var. elongatum West. Var. new to U. S. (H. C. no. 113.) Length 573 μ: breadth 25 μ: apices 19 μ. Pudding Pond, North Conway! This seems to be close to *P. excelsum* (Turner).

* Var. undulatum Schaarschm. Var. new to U. S. (H. C. no. 101.) Length 496 μ: breadth 22 μ: apices 15 μ. Pudding Pond, North Conway!

P. Trabecula (Ehrenb.) Näg. Length 496 μ: breadth 25 μ: apices 25 μ. Noone's Station!

* Forma granulata G. S. West. Length 505 μ: breadth 34 μ: apices 28 μ. Form new to U. S. (H. C. No. 76.) Mt. Moosilauke!

Var. rectum (Delp.) W. & G. S. West. (*Docidium rectum*, Wolle, '92.) Length 250 μ: breadth at base 19 μ: apices 15 μ. North Woodstock!

P. constrictum (Bail.) Wood. (*Docidium constrictum*, Wolle, '92.) (Plate 61, fig. 5.) Length 560 μ: breadth at isthmus 23 μ: maxi-

mum breadth 44 μ: apices 32 μ. End with eight large bluntly pointed teeth, base with a suggestion of nodes. Pudding Pond, North Conway, frequent! Laconia, scarce (Wests).

P. verrucosum (Bail.) Lund. (*P. tessellatum* (Josh.) Lagerh., *P. trochiscum* W. & G. S. West.) Length, 420 μ: breadth at base 28 μ: at apex 22 μ. End with six or eight teeth. From a study of Bailey's original notes it seems safe to place both of the above species as synonyms of *P. verrucosum*. Pudding Pond, North Conway, frequent!

P. nodosum (Bail.) Lund. Length 290 μ: breadth at isthmus 27 μ: maximum breadth 50 μ: apices 34 μ. Intervale, abundant! Pudding Pond, North Conway! Noone's Station! Laconia, not common (Wests) (H. J. no. 480).

Triploceras Bail.

T. gracile Bail. Length 490 μ: breadth at base 25 μ: at apex 24 μ. Pudding Pond, North Conway, frequent! Saco Lake (*Wood*). Laconia, common (Wests) (H. J. no. 649).

* Var. **montana** var. nov. (Plate 61, fig. 6.)

Variety with the apices with two simple processes, the base but six-radiate, whole form slender, apex considerably wider than the rest of the semi-cell. Length 360 μ: breadth at base 16 μ: apex 22 μ. Intervale! (H. C. no. 162.)

T. verticillatum Bail. (Plate 61, fig. 7.) Length 505 μ: breadth 40–47 μ: apices with processes 53 μ. Intervale! Pudding Pond, North Conway! Saco Lake (*Wood*). Laconia (*Wests*) (H. J. no. 649)! This was in all cases seen the form with two bidentate processes at the end.

Var. turgidum Wolle. Rochester (*Wolle*).

Tetmemorus Ralfs.

T. Brebissonii (Menegh.) Ralfs. Length 189 μ: breadth 34 μ. North Woodstock!

T. granulatus (Bréb.) Ralfs. Length 178–236 μ: breadth 36–42 μ: isthmus 29 μ. North Woodstock! Intervale! Pudding Pond, North Conway! Noone's Station!

EXPLANATION OF PLATE 61.

Figure 3, × 660; all others, × 460.

Figure 1. *Closterium Intervalicola* sp. nov.
" 2, 3. *Docidium undulatum* Bail., forma *perundulatum* W. & G. S. West.
" 4. *Pleurotaenium subgeorgicum* sp. nov.
" 5. *Pleurotaenium constrictum* (Bail.) Wood.
" 6. *Troploceras gracile* Bail., var. *montana* var. nov.
" 7. *Pleurotaenium verticillatum* Bail.

(*To be continued.*)

SCROPHULARIA LEPORELLA AT WILLOUGHBY. — While visiting the Willoughby region last August the writer made an exploring trip on the West side of the lake in company with Mr. A. B. Emerson of Barton. We first examined an unreported sphagnum swamp near the lake, known as "Beaver Meadow." Numerous Heaths and Orchids were growing here in considerable quantity, some of which are marked uncommon in the listed flora of the region. This meadow deserves a more careful investigation by botanists. Emerging from the swamp in the direction of the Barton road, and crossing an upland pasture, we came upon a colony of *Scrophularia leporella*, Bickn. The plants were growing vigorously in springy soil and close beside a large boulder. Though late in August several of the thyrses were in full bloom. The writer recognized the genus and giving a specimen to Judge Churchill, he pronounced it *S. leporella*, Bickn. The plant is not in Dr. Kennedy's list of the Willoughby Flora, nor does it seem to have been previously reported from this part of the state. — Geo. H. Tilton, Woburn, Massachusetts.

ILLUSTRATIONS AND STUDIES OF THE FAMILY ORCHIDACEAE,[1] by Oakes Ames, A. M. — Mr. Ames's volume on the orchids is a notable contribution to the knowledge of this vast and difficult group of plants. The work not only shows great care in investigation, but in all details of presentation it is a model of clearness and accuracy. The present volume, which we are glad to learn is the forerunner of a series, deals with subject matter which may be grouped under four heads. In the first part about a score of tropical species, belonging to the genera *Acoridium*, *Cestichis*, *Campylocentrum*, *Ionopsis*, *Coral-*

[1] Fascicle 1; imperial 8vo., 156 pp., 16 pl. Houghton, Mifflin & Co., 8 Apr. 1905.

lorrhiza, *Epidendrum*, *Dendrobium*, *Sauroglossum*, *Liparis*, *Habenaria*, *Cyrtopodium* and *Dendrophylax*, are critically characterized and illustrated. Of these, several from the Philippine Islands are new to science. The second portion is devoted to a systematic and descriptive presentation of the Philippine orchids so far as they have been collected by the botanists of the United States government. About thirty genera and numerous species are here discussed. There follows a description of *Epidendrum variegatum*, Sw., an epiphytic West Indian orchid, recently discovered for the first time in the United States at Palm Beach, Florida, by Mr. Frank Idner. The fourth part, which will be of the greatest interest and assistance to North American botanists, is a revision of the difficult and much confused North American species of *Spiranthes*. In the preparation of this monographic treatment Mr. Ames has examined a well nigh incredible amount of material, and some idea of the detail of the work may be conveyed by the fact that the mere citation of specimens of *Spiranthes cernua* occupies seven closely printed pages. This unprecedented thoroughness in the citation of material examined might seem wasteful of space were it not proved by experience that no feature of a plant monograph is of more practical value to the working botanist.

It is impossible here even to mention, much less to discuss, the numerous points of interest brought out by Mr. Ames in relation to the identity and synonymy of the species discussed.

The plates and text-figures drawn by Mrs. Ames form an attractive and valuable feature of the work, combining to an unusual degree artistic merit and scientific accuracy. Reproduced by the Boston Heliotype Company, the plates show the distinctness of outline and softness of shading characteristic of its superior work.

A note in the preface intimates that future fascicles are likely to present contributions not merely to the taxonomy but to the morphology, physiology, and ecology of the *Orchidaceae*.

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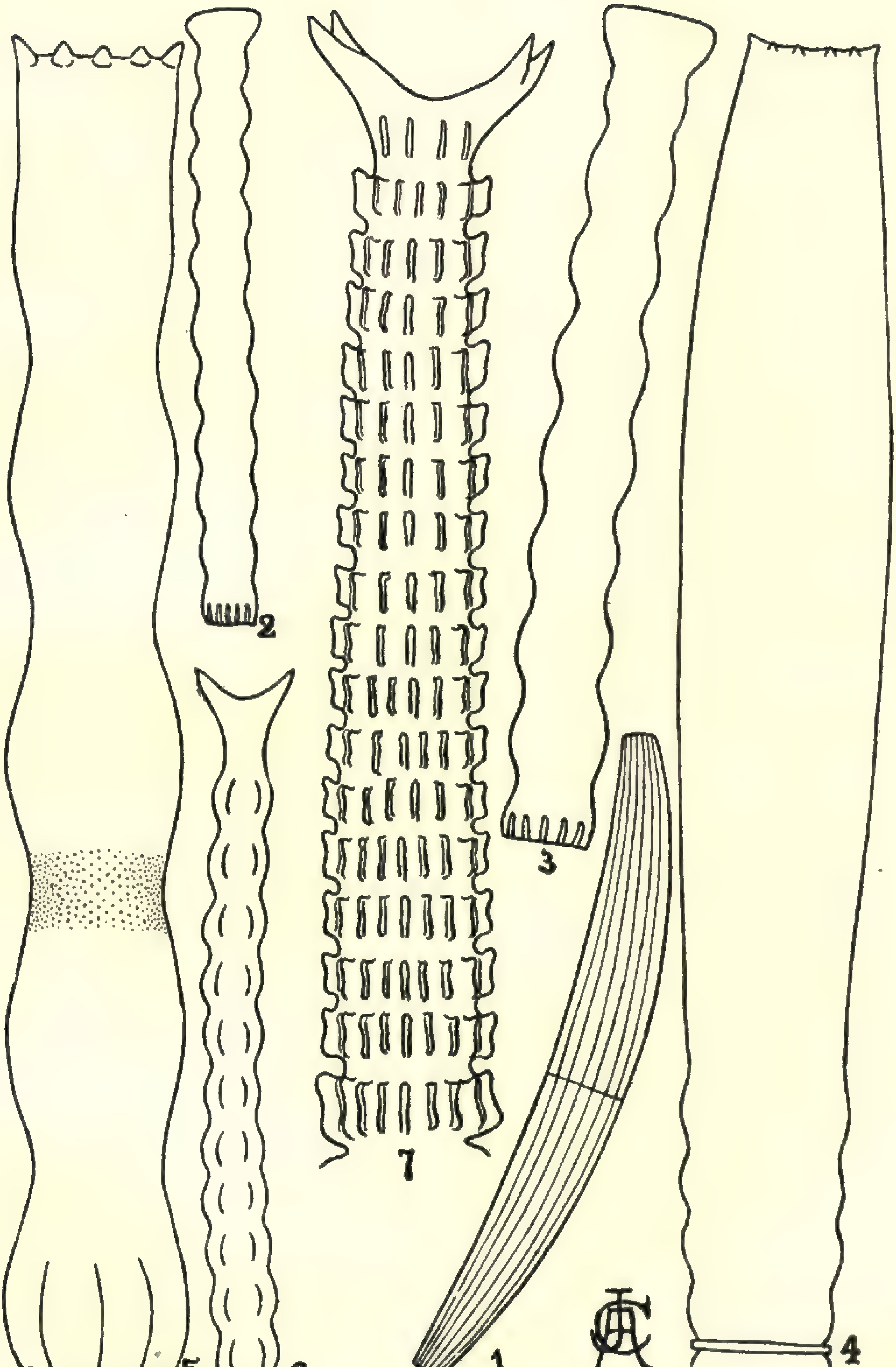

J. A. Cushman del.

Desmids of New Hampshire.

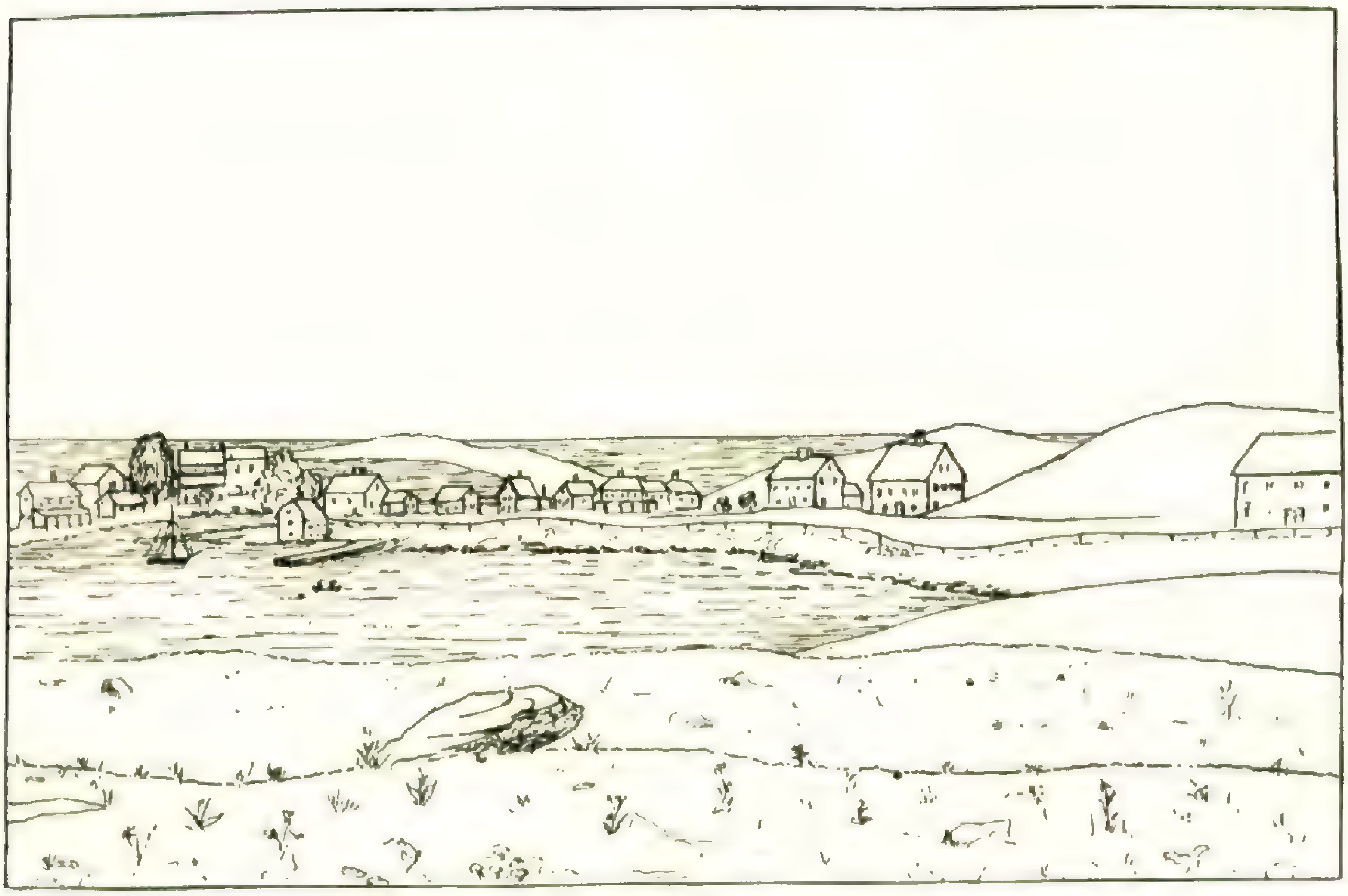

Fig. 1. Woods Hole in 1850.

Fig 2. Woods Hole in 1897.

Rhodora

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REFORESTATION AT WOODS HOLE, MASSACHUSETTS.— A STUDY IN SUCCESSION.[1]

Mintin Asbury Chrysler.

(Plates 62, 63.)

Although the principle known as succession in plant societies is supported by convincing evidence, it does not frequently happen that the process occurs with sufficient rapidity to pass through one or more cycles within the period of one man's observations. Further, because of the newness of the dynamic point of view, records of a kind valuable to the ecologist are not numerous. It is also true that in this country few experiments in forestation have been made. The tract of forest known as Fay's Woods near the village of Woods Hole, Massachusetts, presents, however, a remarkably good example of quick succession of vegetation, aided by artificial planting.

The area in question lies between Buzzards Bay and Vineyard Sound at the southwestern extremity of Cape Cod, comprising about four hundred acres now largely covered with a mixture of pines and deciduous trees. As may be seen from plate 63, fig. 1, the land rises rather abruptly from the sea, and there are abundant evidences to show that the area forms a terminal moraine. Boulders of all sizes are plentiful, and the surface of the tract is particularly uneven owing to the presence of numerous ravines and "kettle holes," as described by Shaw.[2] The general height of the forested area is sixty feet above the sea.

[1] This investigation was conducted at the Marine Biological Laboratory, Woods Hole, during the summer of 1903 and 1904. I am indebted for many helpful suggestions to Miss Sarah B. Fay and Prof. Bradley M. Davis.

[2] Bot. Gazette *33*: 437–450. 1902.

This area is known to have been treeless in 1850, except the ravines in the northern (inland) part of the estate. It is natural to inquire whether this condition existed during the early days of colonization of the region. Gosnold says that the pilgrims in 1620 found Cape Cod harbor "compassed about to the very sea with oaks, pines, juniper, sassafras, and other sweet wood,"[1] also that the island now known as Nonamesset (across the channel from Woods Hole) was "full of wood, *vines*, and berries."[2] It is known that the neighboring island of Nantucket[3] was in 1661 well provided with forests of oak, walnut, beech, pine and cedar, and that these were largely destroyed by cutting and by the sheep and goats which were so extensively reared on the island; in 1665 there were forty-eight owners of herds and flocks on this island alone. Most of the people who settled Nantucket came from the mainland and probably transferred the herding industry to their new home. The climatic conditions on the peninsula of Cape Cod are certainly no more severe than those on the island of Nantucket, so it is pretty safe to infer that the region about Woods Hole was well forested three hundred years ago, and destroyed by cutting and grazing, despite the impression which is prevalent in that neighborhood to the effect that the region was naturally treeless.

Undoubtedly the conditions in this area are at present unfavorable for tree growth, chiefly because the area is well drained owing to slope and nature of the soil, and perhaps because of the salt winds which almost constantly blow either from Vineyard Sound or Buzzards Bay. Hence natural reforestation is exceedingly slow. Nature's unaided efforts are shown in the tract lying between the forested area on one hand and Buzzards Bay and Quisset Harbor on the other. This area known as Ganset has lain undisturbed for at least sixty years and probably much longer. The plant covering is mainly herbaceous, with scattered clumps of stunted shrubs, and here and there solitary specimens of *Juniperus virginiana* 4–8 feet high. The herbaceous plants are moderately xerophytic in nature, being chiefly *Cladonia rangiferina*, *Polytrichum commune*, *Lechea* sp., *Hypericum perforatum*, *Trifolium pratense*, *Potentilla canadensis*, *Achillea millefolium*, *Chrysanthemum Leucanthemum*, var. *subpinnati*

[1] Quoted in Freeman, F., History of Cape Cod, page 62.

[2] Ibid., page 30.

[3] W. R. Bliss, Quaint Nantucket. Boston, 1896.

fidum,[1] *Poa* spp., *Sisyrinchium angustifolium*. The clumps of shrubs consist of *Myrica carolinensis* (*cerifera* of New England) and a dwarf form of *Rhus copallina* with which *Rubus villosus*[2] is sometimes associated. The boundary between this area and the adjoining planted tract is pretty clearly marked, though young specimens of *Pinus sylvestris* and *P. rigida* are frequent near the line and a few specimens are scattered through the open area. These young trees have undoubtedly sprung from seed which has blown from the planted tract.

In 1850 the whole area under consideration was more barren than the portion just described. Plate 62, fig. 1, which is a pen copy by Prof. Davis from a water-color owned by Miss Fay, gives an idea of the bareness of the region at that time. Fig. 2 shows the aspect of the same region in 1897. The striking change in the plant covering of the region has been partly brought about through the efforts of the late Mr. J. S. Fay. But he had better tell his own story; the following is an extract from an address delivered by him in Boston in 1878:

"I will come now to my own experience, which is perhaps what you most want to hear, but which can be briefly stated. In 1851 I took possession of a place which I had purchased at Woods Holl, at the southwestern extremity of Cape Cod, on a peninsula between Vineyard Sound on the south and Buzzards Bay on the north, to the shores of both which my land extended. My house was prettily situated with regard to the water, fronting south, standing above Little Harbor, so called, and looking upon and over the Sound. In the rear, to the northward, the land rose gradually but not far, till it reached a ridge or series of bare hills, running parallel to and overlooking the Sound. Over and behind these, on the north slope and in a valley, unseen from the water on the south, were about twenty-five acres of natural growth of oak, hickory, beech and hop hornbeam, with a few pepperedge and red maples on the borders of a swamp. In sight of my house, about the harbor, and on the road, however, and indeed in all the village, there was not a single tree to be seen (except three Balm of Gileads), nor was there a single evergreen, on my whole place.

[1] See RHODORA 5: 181. 1903.

[2] As defined by Bailey, Evolution of Native Fruits, 371.

I began in the spring of 1852 to plant a variety of trees for ornament, but as may be supposed, at fifty cents each from nurserymen, a very extensive planting would have been quite costly. I therefore, at the suggestion of my brother, Richard S. Fay, of Lynn, imported from England about 20,000 seedlings, comprising Scotch larches, and birches, Austrian and Scotch pines, English oaks and sycamores, and Norway spruces. They came through the voyage well, and I placed them in a nursery, where they throve. About the same time, I began to transplant the native white and pitch pines from the old fields in the eastern part of the town (Falmouth) and to cover with them the bare gravelly hills in the rear of my house and fronting the water. After the imported trees had been cultivated in the nursery two years, I transplanted them and mixed them with the native pines, and also placed them in the vacant spots and openings, and on the outskirts of a twenty-five acre wood lot back of my house. They all did well. Beyond this wood lot, I had nearly 200 acres of old pasture and arable land (not much of the latter) stretching away northward to Buzzards Bay, on which there was not a tree large enough to give shade to a rabbit. Upon the sixty acres nearest home which I reserved for pasture, I planted half acre clumps of the imported trees, surrounding them with cheap fences of wire, drawn through posts, to keep off the cattle, until they should grow large enough for shade. Most of these trees are now of good size, and are doing well. About my house, where formerly there was not a tree, and where my neighbors said I could not make them grow, right in the face of the salt bearing southerly gales, the hills are covered with large pines, spruces, and other trees, and my buildings seem rather to have been planted in a grove, than that the grove should have been brought to them. And yet I have already cut away many trees, because they are too crowded. But after all this planting with the spade, I had upwards of a hundred acres of very poor pasture land, still bare of trees, and for which I had no use. It was overgrown in many places with patches of bushes, and much of the grass had given way to moss. It occurred to me that the easiest and cheapest way to utilize and improve this tract, would be to plant it with the seeds of trees and leave it to take care of itself. As there were no evergreens in the neighborhood, except those which I had set out near home, and as the Scotch and Austrian pines and Norway spruce seemed to stand the sea air well, I concluded to sow

Fig. 1. Krummholz on Buzzards Bay.

Fig. 2. Oaks replacing Scotch Pines.

these varieties which I imported, mixing them with the seeds of the native sorts. I began in 1861 to scatter them broadcast on the sward, without any care or system, and continued it for three or four years, and now I have a stretch of nearly one hundred acres covered with a dense growth of evergreen trees, giving pleasure to the eye and the promise of great usefulness."

If one now walks through the woods with this description written in 1878 in hand, he readily sees that in the course of twenty-five years a considerable change has come over the face of the landscape, now characterized mainly by the presence of many deciduous trees mixed with the evergreens and in many places outnumbering the latter. Moreover, the older Scotch pines present a sickly appearance, having many bare branches, though young specimens look particularly vigorous. Plate 63, fig. 2, represents an elevated spot near Buzzards Bay, in the tract mentioned as planted subsequent to 1861. Most of the trees in the background are *Pinus sylvestris*; it will be noticed that the oldest ones look decidedly unhealthy. Some dead specimens have been cut out in the foreground. The seedlings which have grown up under the shelter of the pines are here as in all parts of the woods *Quercus tinctoria* and *Q. alba*, with a few *Pinus sylvestris*. The spot pictured is not quite typical of the whole woods, for it was chosen on account of the open character of the vegetation. Usually the oaks are considerably larger, and with them are hickory, white and pitch pine, maple, all in smaller numbers than the oaks. The shrubs not clearly shown in the photograph are *Rhus copallina*, *Myrica carolinensis* and *Rubus villosus*, which may be regarded as relicts, and *Prunus serotina*, *Amelanchier canadensis*, *Rhus toxicodendron*, *Corylus rostrata*, *Viburnum dentatum*, which accompany the deciduous trees in the mesotropic development of the flora, and hence may be called pioneers.

The various parts of this piece of woodland present quite different appearances on account of (1) the differences in planting, as well as of (2) physical conditions such as drainage. Several areas on which English larch predominates illustrate the first conditions; these trees have been planted to replace the pines, and have suffered from the ravages of an insect which destroys the leaves. In other parts English white oak (*Q. robur*), white pine, Austrian pine, spruce, catalpa, sycamore maple, Norway maple, and locust (*Robinia pseudacacia*) are more or less prominent. Areas illustrating the second

condition are characterized by beeches and Chamaecyparis which have spread from low-lying tracts; the latter tree is dominant in certain swamps, as described by Shaw (l. c.).

In order to test the application of principles of succession to the area in question it is necessary to know just which species have been planted artificially, and which have come in naturally. Accurate information has been obtained from Miss Sarah B. Fay and Mr. M. H. Walsh, who have witnessed many of the changes already described. Evidently the European forms were introduced, *viz.*, Scotch and Austrian pines, larch, Norway spruce, English oak, sycamore maple, and the same is true of the older pitch and white pines, according to Mr. Fay's manuscript. Some of the trees represent the original planting, while others, *e. g.*, the group of larch, have been set out to replace the defunct Scotch pines, while most of the young pines have sprung up from seed produced by the older trees. It has been ascertained that none of the oaks were planted, — a point of some significance. The beeches, hop hornbeam, tupelo, and all the shrubs have appeared naturally. Apparently most of the hickory has been planted, though the tree commonly occurs in sheltered places in the region. It appears then that this forest has by the aid of man quickly passed into and through the *pine* stage, and is now in the early part of the *oak* stage. There are but few signs of its passing into the *oak-hickory* stage, much less of its being in the *maple-beech* stage, which is regarded by Cowles as the climatic climax forest of the region. Probably the climatic conditions are such that the area in question may never see this climatic climax, although in a moderately sheltered situation in the northeastern part of the adjacent island of Naushon there occurs a fine beech forest.

The principal factor which has brought about the changes described seems to have been the short life of the Scotch pine; but why should its life be so much shorter in Massachusetts than in Scotland? It has been suggested that a borer is responsible; also that the soil "gave out" in the planted areas. This view is negatived by the observation that young specimens show a vigorous growth in the immediate neighborhood of the old and dying trees. Probably some undetermined feature of the climate here renders the trees short lived. The salt-laden winds would naturally have more effect on the trees as they grew taller. This idea is borne out by Mr. Fay's experiments in planting hickory trees, which were found to

come up quickly and to thrive until they raised their heads above the general level of the forest; then it seemed that the salt winds struck them and they soon showed signs of decay.

Concerning the rapid appearance of seedlings of deciduous trees, especially oaks, the source is sufficiently indicated by Mr. Fay's reference to the natural grove in the valley near the house, and no doubt other depressions also contained trees. It is always difficult to understand how a heavy seed such as an acorn can be so rapidly dispersed; in the present case Mr. Fay always claimed that the squirrels and blue jays were responsible; the latter have for a long time been plentiful in the region. Once germinated the very tolerant oak seedlings could afford to bide their time, which soon came in this instance on account of the short life of the Scotch pines. Severe storms such as that which occurred in 1898 have no doubt blown down many pines and thus formed openings which oaks have quickly filled up.

The Krummholz.

On the Buzzards Bay shore occurs a rather remarkable formation which illustrates the action of certain factors already referred to. As shown in plate 63, fig. 1, the land rises abruptly from a strand covered with boulders, then descends, and further inland rises gradually to the general level of the wooded tract. Nearest to the strand the only plants are *Lathyrus maritimus* and *Ligusticum Scoticum* — two characteristic halophytes of the region, *Poa* sp., *Trifolium arvense*, *Lechea* sp. A little higher up *Myrica carolinensis* is associated with these and clumps of this are seen in the left of the picture. Near the top of the slope appear dwarf specimens of Scotch pine, the ones nearest the water being smallest, their height gradually and regularly increasing on the inland part of the tract though the surface of the ground here descends, as stated earlier. The trees composing this formation are gnarled and twisted into fantastic shapes, and are so closely set that they form an impenetrable thicket. The level of the top of the trees is so regular that it gives one the impression that some giant has trimmed the trees with his scythe. Although *Pinus sylvestris* forms the bulk of the formation, there is a small proportion of *P. rigida* and *P. austriaca*, and a few specimens of *Juniperus virginiana* and of *Rhus copallina* are scattered through

the tangle. The term *krummholz* (literally "crooked wood") is usually applied to a mountain formation,[1] but the characters are so perfectly reproduced in the present instance that the application of the term may with profit be extended. The cause for this stunting of the trees is probably to be sought in the mechanical and drying action of the wind. The prevailing winds at Woods Hole are from the southwest; these would exert their full effect on the area in question, for it faces the west and is bounded on the south by a bay whose shore owing to wave action is littered with boulders. The mechanical action of the wind causes the greater development of branches on the east (leeward) side of a tree and the pronounced leaning of the trees in that direction; marked examples of this action are also to be seen on the neighboring island of Naushon. What has been referred to as the drying action of the wind causes a high rate of transpiration, *i. e.*, high compared with absorption; this results in a general dwarfing of the tree and in the death of some of the branches. It may be urged that a sea-breeze is damp rather than dry, and undoubtedly this is the case at times; but ordinarily the moving air is less nearly saturated than air which is stationary around a transpiring leaf. The action of salt present in the wind is certainly not the primary factor, for a krummholz can be formed in places far removed from the sea, but the harmful influence of salt on most vegetation is so certain that it probably has some influence here. It is reported that trees a mile inland on the island of Martha's Vineyard become incrusted with salt during winter storms. That the wind is the chief agent in producing the krummholz seems exceedingly probable from the mowed-off appearance of the "surface" of the formation.

Conclusion.

It has been the writer's attempt in this short account to show that the agency of man may accelerate the process called succession. The exposed nature of the area under consideration would have rendered the progression from a heath to a forest a slow one, but through the artificial introduction of conifers and by reason of the short life of these trees a second stage in reforestation, *viz.*, domi-

[1] Schimper, A. F. W., Pflanzengeog. p. 740.

nance of oaks, has in fifty years been nearly attained. Probably the conditions are too severe to permit the eventual appearance of the climax formation (maple-beech), except in the more sheltered parts of the area. This study also shows what may be accomplished by a determined man in covering a naked area with beautiful and useful trees. The best way to utilize much of the unproductive land in this state is to plant suitable trees and treat them in accordance with the accepted principles of forestry.

HARVARD UNIVERSITY.

EXPLANATION OF PLATE 62, Fig. 1. Woods Hole about 1850, from east side of Little Harbor. Outline copy of an old water-color in the possession of Miss Sarah B. Fay. Fig. 2. Photograph taken in 1897 from the same point as in figure 1.

PLATE 63, Fig. 1. Krummholz on shore of Buzzards Bay, viewed from the south. Fig. 2. A rather open part of the forest, showing the unhealthy Scotch pines, and young oaks replacing them.

THE NORTH AMERICAN SPECIES OF ERIOPHORUM.

M. L. FERNALD.

PART 2. NOTES ON THE PRECEDING SYNOPSIS.[1]

GENERIC STATUS OF ERIOPHORUM.

LINNAEUS, in first defining the genus *Eriophorum*,[2] referred to a figure of Micheli's *Linagrostis*.[3] This figure, although a conventionalized drawing, represents an ovoid spikelet with very numerous scales, and dissections of the spikelet, showing a perianth of numerous bristles. From this old figure one may safely infer that the original *Eriophorum* as interpreted by Linnaeus in his Genera Plantarum was a plant very near if not the European *E. vaginatum*. Later, in the Species Plantarum,[4] Linnaeus distinguished four species of *Eriophorum*, the European *E. vaginatum* and *E. polystachion*, the American *E. virginicum*, and the European *E. alpinum*, species which have subsequently stood as typical of *Eriophorum*, although, in 1772,

[1] RHODORA, vii. 81–92.

[2] L. Gen. 12 (1737).

[3] Micheli, Nov. Gen. 53, t. 31 (1729).

[4] L. Sp. 52, 53 (1753).

Scapoli[1] revived for the three European species the prelinnean generic name *Linagrostis*.

In the second edition of the Species Plantarum, however, Linnaeus added to his *Eriophorum*, *E. cyperinum*,[2] the type of a large American group of species, the Wool Grasses, whose affinities are with *Scirpus*, a fact which Linnaeus himself suspected as shown by his note: "*statura omnino* Cyperi, *sed Spiculæ* Scirpi, *nisi Semina maturescentia producerent Lanam gilvam S. testaceam, vix spiculis longiorem*." By those systematists who have followed Linnaeus in including with the true Eriophorums having long straight flattened bristles, the very dissimilar *E. cyperinum* with crinkled and strongly curled terete bristles, such generic distinctions as otherwise separate the genera *Eriophorum* and *Scirpus* are obscured and the former separated from the latter merely by the perianth bristles without barbs and more or less exceeding the scales of the spikelets.

That this treatment would place the two genera upon an absurdly weak footing is well shown by three nearly related species. *Scirpus Peckii*, Britton, is habitally closely similar on the one hand to the Wool Grass, *Eriophorum lineatum*, Benth. & Hook., and on the other hand so close to the unquestioned *Scirpus*, *S. polyphyllus*, Vahl., that in his original description a specimen of the latter was confused by Dr. Britton with the Peck specimen.[3] Yet, *Eriophorum lineatum* has curly elongate barbless bristles which place it near *E. cyperinum*. L.; *Scirpus polyphyllus* has the bristles barbed much as in *S. atrovirens*, but usually bent or slightly curled; and *Scirpus Peckii*, with bristles elongated and curled much as in *Eriophorum lineatum*, often has a few weak barbs at the tip. These plants, obviously inseparable as genera, all have innumerable small spikelets, small appressed scales, and 6 perianth-bristles, and by many authors they are maintained as members of the genus *Scirpus*,[4] a course which seems rational and open to no question.

[1] Scop. Fl. Carn. ed. 2, i. 47 (1772). [2] L. Sp. ed. 2, 77 (1762).

[3] See Brainerd, Rhodora, iii. 32 (1901).

[4] *Eriophorum japonicum*, Maxim. Bull. Acad. Sci. St.-Pétersb. xxxi. 111 (1886 and Mél. Biol. xii. 558 (1886), in its 6 bristles somewhat scabrous at tip is clearly a *Scripus* and a full sheet of specimens in the Gray Herbarium, collected by Charles Wright on mountain tops near the Ochotsk Sea, shows it to be related on the one hand to the *Scripus sylvaticus* group, and on the other to *S. cyperinus* and its allies. This plant of the mountains of eastern Asia should be called ***Scirpus japonicus***, n. comb.

The removal of the tall *Eriophorum cyperinum* and its numerous allies from the genus leaves what is in many ways a natural group; but as treated by Linnaeus in the first edition of the Species Plantarum and as ordinarily accepted, *Eriophorum* contains one species, *E. alpinum*, which, like the Wool Grasses, still leaves the genus unsatisfactorily distinguished from *Scirpus*. With the exception of this single species, *Eriophorum alpinum*, the members of the genus (with *E. cyperinum* and its allies removed to *Scirpus*) have many characteristics in common which define the group as a well marked genus. All have the membranous scales of the spikelets with spreading or loosely ascending tips, and the perianth of many slender ligulate bristles;[1] and in the monocephalous species, *E. vaginatum*, &c., with which *E. alpinum* has been associated, the culms are usually invested with loose often somewhat inflated membranous-tipped sheaths; the spikelets are large, of very numerous membranous or scarious spreading or spreading-ascending scales, several of the lower empty, and the outermost enlarged, 3-several-nerved and persistent.

Eriophorum alpinum, however, which has been very generally treated as a close ally of *E. vaginatum*, &c., but which, with *Scirpus cyperinus* and *S. lineatus*, was made by Persoon the basis of another genus, *Trichophorum*[2] has characteristics which separate it very clearly from *Eriophorum*. The sheaths of *Eriophorum alpinum*, confined chiefly to the base of the plant, are close and firm; the spikelets subulate-ovoid, about 5 mm. long, of few incurved-ascending chartaceous scales, the outermost of which is caducous and has its strong green costa prolonged into a blunt mucro; and the ligulate bristles are only 6 in number. In all these characteristics the plant is so closely similar to the boreal *Scirpus caespitosus*, L., and *Scirpus alpinus*, Schleicher, that more than one student of the group has commented upon the fact. Thus, in 1836, Torrey remarked that "This Eriophorum differs from all the other single-spiked species of the genus in the rigid scales of the spike, and in the definite crisped bristles";[3] and by others, as recently, in a very detailed discussion of the anatomical structure of the stems of the plants which have

[1] By some authors spoken of as ligulate segments of 6 deeply cleft bristles (see Clarke in Hook. Fl. Br. Ind. vi. 663).

[2] Persoon, Syn. i. 69 (1805).

[3] Torr. Ann. Lyc. Nat. Hist. N. Y. iii. 335 (1836).

passed as *Eriophorum*, by Palla[1] *Scirpus caespitosus* is placed with *Eriophorum alpinum* in the genus *Trichophorum*.

Limited as it was by Palla to *Trichophorum alpinum*, Pers. (*Eriophorum*, L.) and *T. caespitosum*, Schur. (*Scirpus*, L.) with barbless ligulate bristles, and *T. atrichum*, Palla (*Scirpus alpinus*, Schleicher) without bristles, *Trichophorum* would have a strong morphological basis for separation from both *Scirpus* and *Eriophorum*. In eastern North America, however, there is a plant, *Scirpus Clintonii*, Gray, which, in habit, spikelets, chartaceous scales, the outermost deciduous and with the strong green costa prolonged into a mucro, is clearly to be placed with *Trichophorum alpinum*, *T. caespitosum*, and *T. atrichum*. This plant, in its spikelets is, in fact, more like *Trichophorum* (*Eriophorum*) *alpinum* than that species is to *T.* (*Scirpus*) *caespitosum*, but its perianth-bristles are not only terete but very freely setulose. In these characteristics *Scirpus Clintonii* is close to *S. pauciflorus*, Lightf., a species which Palla very definitely excludes from *Trichophorum*.[2] Thus *Scirpus Clintonii* combines to such an extent the morphological characteristics of *Trichophorum* as interpreted by Palla and *Scirpus pauciflorus* which Palla regards as a *Scirpus* as to indicate that the characters upon which *Trichophorum* is maintained by him are not truly concomitant and that the genus is at best a subgenus of *Scirpus*, with close affinity to *S. pauciflorus* and *S. nanus*.

The plant which led to this discussion, *Eriophorum alpinum*, L., is, then, a species of *Scirpus* rather than of *Eriophorum* in its limited sense; but as there is already a *Scirpus alpinus*, Schleicher, it has been necessary in transferring *Eriophorum alpinum* to use a specific name which shall not duplicate Schleicher's already established combination, *Scirpus alpinus*. This was recently done by Ascherson and Graebner, and henceforth the densely caespitose *Scirpus* with elongate ligulate white bristles should be called *S. Trichophorum*, Ascherson & Graebner.[3]

In the paper already referred to, Palla maintains that *Eriophorum*

[1] Bot. Zeit. liv. ab. 1, 145, 151 (1896).

[2] "Hier sie auf eine unrichtige Angabe Richter's in seinen 'Plantae Europeae,' S. 139, aufmerksam gemacht. Richter führt unter den Synonymen des *Scirpus pauciflorus* Lightf. ein *Trichophorum pauciflorum* Palla auf. Ein solches ist von mir nie aufgestellt worden." — Palla, l. c. 146.

[3] Asch. & Graebn. Syn. ii. ab. 2, 302 (1903).

virginicum, L., is an endemic American genus, *Eriophoropsis*, which he separates on characters confined strictly to the anatomical structure of the stem and leaves, himself admitting that in its fruiting characters and in its bristles the plant cannot be separated from *Eriophorum*.[1] Until the anatomical characteristics maintained as distinguishing *Eriophoropsis* are corellated with some leading morphological characters of the inflorescence or the perianth, the plant will scarcely receive general recognition as a unique genus.

With the transfer to *Scirpus* of the two elements, *Eriophorum cyperinum*, L., and its allies, and *Eriophorum alpinum*, L., which made up Persoon's *Trichophorum*, the genus *Eriophorum* becomes one with strongly marked habital characteristics, and with the perianth consisting of numerous elongate flat straight bristles.

Eriophorum Chamissonis.

The status of the name *Eriophorum Chamissonis* has been the source of much perplexity, and without entering in detail into its history it is impossible to gain a just impression of its significance. On the 9th of November, 1825, Dr. C. A. Meyer presented to the St. Petersburg Academy a paper entitled "Cyperaceae Novae descriptionibus et iconibus illustratae," but the paper was not actually printed until 1831.[2] Among the species described was *Eriophorum Chamissonis* [3] based upon "*Erioph. intermedium Cham.* in litt.," not *E. intermedium*, Bastard, clearly described in more than a page of text and beautifully illustrated by a detailed plate. The plant was said to have the "Habitat in Kamtschatka et Unalaschka, nec non in alpibus Altaicis," and the very clear plate shows that it is a species well known near the coast of Alaska and Kamtschatka, extending south to Mandschuria, which is generally recognized as identical with the later *E. russeolum*, Fries, of northern Europe. If the name, *E. Chamissonis* were based solely on the description and plate of Meyer, there would be no question as to its merits; but, unfortunately, an Altai plant was also cited; and between the original drafting of the

[1] "*Eriophoropsis virginica* sieht zur Zeit der Fruchtreife einen *Eriophorum* überaus ähnlich . . . . Der Bau der Perigonborsten ist der nämliche wie bie *Eriophorum latifolium*."— Palla, l. c. 150.

[2] Mém. Sav. Étrang. Acad. St. Pétersb. i. (1831). [3] l. c. 204, t. 3 (1831).

diagnosis of the species in 1825 and its actual publication in 1831, Ledebour published in his Flora Altaica, in 1829, *E. Chamissonis*, ascribing it to Meyer, citing *E. intermedium* of Chamisso's letter and giving almost Meyer's own description of the Unalaskan and Kamtschatkan plant. Ledebour, however, in this first actual publication of *E. Chamissonis*, cited primarily plants from the Altai which subsequently proved to be unlike the Chamisso plant. Thus arose a confusion which has always been troublesome.

The exact identity of the Alati element of *Eriophorum Chamissonis* has been somewhat questionable. By Fries it was apparently taken to be *E. Scheuchzeri* (*E. capitatum*, Host)[1] but by Nylander in his Monograph the Altai element of *E. Chamissonis* is treated as *E. vaginatum*, var. *humile*,[2] the name based upon *E. humile*, Turcz. Bull. Soc. Nat. Mosc. (1838) 103, which was a *nomen nudum*; though by C. B. Clarke[3] *E. vaginatum*, var. *humile*, Nylander, is referred without question to the stoloniferous noncaespitose *E. Scheuchzeri*. A sheet of the original Altai material sent from the Herbarium of the St. Petersburg Academy to the Gray Herbarium and labeled in the characteristic hand of C. A. Meyer "*Eriophorum Chamissonis* C. A. M. *Fl. Alt.*" represents a densely caespitose non-stoloniferous plant closely related to *E. vaginatum* and quite inseparable from the original very clear figure of *E. callitrix*, Chamisso.[4] There can be no question, then, from this authentic material, of the identity of the Altai component of *E. Chamissonis*.

That the name *E. Chamissonis* should be used for the stoloniferous non-caespitose plant of Kamtschatka and Unalaska, obviously the plant collected by Chamisso, which was clearly described and illustrated by Meyer and definitely included by Ledebour in his description, seems open to little question; and in that sense, which was so clearly intended when the name was first put forward and which is indicated by the citation in the Flora Altaica of *E. interme-*

[1] "Hoc, nempe *E. Chamissonis* C. A. Meyer, est omnino *E. capitatum* Suecorum." — Fries, Novit. Mant. iii. 170.

[2] *E. vaginatum* var. "*humile* Turcz (= *E. Chamissonis* C. A. M. fl. alt.) : culmis caespitosis, vaginis fibrillosis, capitulo subsphaerico, squamis ovato lanceolatis, cinereo-pellucidis. (Siberia altaica etc.)" — Nylander, Acta, Soc. Sc. Fenn. iii. (1852), according to Andersson, Bot. Not. (1857) 58.

[3] Clarke in Hook., Fl. Brit. Ind. vi. 664 (1893).

[4] Chamisso in C. A. Meyer, Mém. Sav. Etrang. Acad. St. Pétersb. i, 203, t. 2 (1831).

dium, Chamisso, the name is taken up in this paper. Fries, himself, until he learned that the Altai plant was unlike the Kamtschatka and Unalaska specimens, treated his own *E. russeolum* as a synonym of *E. Chamissonis*, and the same course is followed by Nylander, Richter and some other European students.

Eriophorum Callitrix.

The name *Eriophorum callitrix* (or *callithrix*) has been taken up by Scandinavian authors[1] for a very slender glabrous plant which in many characters is unlike the original description and plate of Chamisso's species.[2] This original figure represents a plant whose low stoutish habit, short broadish leaves, subinflated upper sheaths, and ovate-lanceolate scales, are all unlike those of the very slender plant represented as *E. callitrix* in Flora Danica,[3] a characteristic species of broad northern range, and by no means rare in the western portions of Canada. Chamisso's description of the leaves, "sub lente margine (apice basique evidentius) tenuissime serrulato-scabra" .... and "folia fasciculorum sterilium angustiora et evidentius serrulata," is also difficult to reconcile with the almost entirely glabrous (except at the very tip) filiform leaves of the plant long treated by European botanists as *E. callitrix*.

The original plate of *Eriophorum callitrix*, however, very closely matches some northern specimens of the common American representative of *Eriophorum vaginatum*, a plant in which the leaves are usually scabrous on the margins, although the scales are often paler-margined and with more slender tips than represented in the original description and plate. In the latter character, however, the American plant, like the European *E. vaginatum*, is very variable, and many specimens show scales which in color and form are quite inseparable from those of the Chamisso plant.

As already stated in the discussion of *Eriophorum Chamissonis*, the Altai plant included in the original description of that species, and represented in the Gray Herbarium by specimens labeled by

[1] Anders. Bot. Not. (1857) 60; &c.

[2] Cham. in C. A. Meyer, Mém. Sav. Étrang. Acad. St. Pétersb. i 203, t. 2 (1831).

[3] Fl. Dan. Suppl. t. 122 (1874).

Dr. Meyer himself, is the densely caespitose comparatively stout *E. callitrix*, with depressed-globose heads, and the Altai material might easily pass as the basis of the plate accompanying Chamisso's original description.

That *Eriophorum callitrix* (in its original sense) was regarded by Chamisso and Meyer as specifically distinct from *E. vaginatum*, there is no doubt, although the unfortunate mixing of Altai specimens with the very different stoloniferous noncaespitose *E. Chamissonis* created a serious confusion. Nylander in his Monograph[1] recognized the Altai plant as at least varietally separable from *E. vaginatum*, and, judging from their description, Trautvetter and Meyer have since published it anew as *E. brachyantherum*[2] from northeastern Asia.

The slender plant taken by Scandinavian botanists as *Eriophorum callitrix* was first described by Björnström in 1856 as *E. vaginatum*, var. *opacum*, but was soon recognized by all European botanists as a species distinct from *E. vaginatum*, and they have very generally followed the lead of Andersson who supposed it to be Chamisso' *E. callitrix*. This plant (*E. opacum*) has its greatest development in the Canadian Rockies, but it extends eastward to the Great Lakes, and very locally across Arctic Asia to Spitzbergen and Arctic Scandinavia.

Gray Herbarium.

GYMNOGONGRUS TORREYI (AG.) J. AG.

William Albert Setchell.

Carolus Agardh described, in 1822, in his Species Algarum (p. 254), an alga sent to him from New York by John Torrey, which he named *Sphaerococcus Torreyi*. In 1824, he repeated the description in his Systema Algarum (p. 218) in even briefer form than in the first publication. In 1830, Greville, in his Algae Brittanicae (p. LV) referred by synonym the plant, which he may never have

[1] Nylander, Acta Soc. Sc. Fenn. iii. (1852).

[2] Trautv. & Meyer in Middend. Reise, — Fl. Ochot. 98 (1856).

seen, to the genus Chondrus, making the binomial, *Chondrus Torreyi.* In 1851, J. G. Agardh, in the second volume of his Species Algarum (p. 319), refers the plant of his father to the genus Gymnogongrus. The name, *Gymnogongrus Torreyi*, thus given by J. G. Agardh is retained by the species to this day and farther than the information given by the original describer, we have nothing to help us in the definite placing of the plant.

No farther help is given by Kuetzing, who, in his Species Algarum (p. 738), simply repeats the description of C. Agardh, and the name has remained one of those which must necessarily be kept in the list of "Species inquirendae." There have been several attempts to unravel the identity of the species, however, but without satisfactory outcome. J. W. Bailey, in an article in the American Journal of Science for 1848 (p. 39) says under *Dasya elegans* Ag., "unless I am greatly mistaken, *Sphaerococcus Torreyi* was founded on a battered specimen of this plant" and goes on to say that his reason for expressing this opinion is founded on an examination of a fragment of the original specimen preserved in Dr. Torrey's Herbarium. Harvey, in the second volume of the Nereis Boreali-Americana (p. 166) is inclined to refer a fragment received from Hooper, to this species, but without satisfying himself that it really belongs to Agardh's species. J. G. Agardh, in the third volume of the Species Algarum (Epicrisis, p. 210), states that the species had never been rediscovered and intimates that certain plants supposed to belong to this species were simply extremely narrow plants of *Gracilaria multipartita* which differ from the type, both in external form and in internal structure. Farlow has nothing to add and says in his New England Algae (p. 146) that the species is known only from the description of C. Agardh, which leaves its status in a very undesirable condition.

An examination of the Herbarium of J. G. Agardh in the University at Lund, Sweden, made through the kindness of Dr. Otto Nordstedt, the Curator, has helped the writer toward a solution of the difficulty. The types were readily found and are more plainly marked than some of the types of the species created by C. Agardh. There are six plants included under No. 24119. They are labelled "New York, Torrey, in Hb. C. Agardh," evidently in the handwriting of J. G. Agardh, while in another hand, presumably C. Agardh's, is written "*Sphaerococcus Torreyi.*" A careful examination

of one of these plants shows that the compression called for by the description hardly exists. When sections are examined, the compression is so slight that it hardly departs from the cylindrical. In all other respects, color, wiry habit, branching, etc., the plants are so closely resembling *Ahnfeldtia plicata* that the writer feels quite safe in referring them to that species as a robust form, such as is not infrequently met with on the coasts of New England and such as is common on the coasts of the Pacific United States. The color is particularly that characteristic of slightly faded *Ahnfeldtia plicata.* It may be that future workers will divide *Ahnfeldtia plicata* into forms, or even into separate species. Schmitz (Flora, 1893, pp. 393, 394) in fact, voices what is even more than a doubt as to whether the plant of the region of Cape Horn and also the plant of the Ochotsk Sea, are either of them identical with the plant of the North Atlantic. But even the plant of the North Atlantic Coasts varies considerably in coarseness, and there seems to be little other difference to separate them. The internal structure is the same and in this respect the types of *Gymnogongrus Torreyi* agree perfectly with plants of North Atlantic *Ahnfeldtia plicata.*

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An Extension of Range of Eatonia pubescens. — *Eatonia pubescens*, Scribner & Merrill, is common on some of the brackish meadows, which lie along the west shore of New Haven harbor, between New Haven and Savin Rock. It is a stout grass, with the lower sheaths and leaves, and also the back of the ligule, softly and densely pubescent. The spikelets are very like those of *E. obtusata.* It is generally in full bloom about the middle of June. I collected it here in 1903, and again in 1904, and usually found it in very wet situations, which could only be reached with comfort at low tide, although it has been described as a plant of dry soil. It was abundant at most of the stations. Mr. Fernald informs me that there is a sheet of this grass in the Gray Herbarium collected by Dr. E. H. Eames on "dry roadside on salt meadows, Fairfield, Conn., June 24, 1902." In the appendix to Britton's Manual, Pennsylvania is give as the northern limit of this essentially southern species, but its occurrence at New Haven and also at Fairfield, twenty miles west of New Haven on Long Island Sound, shows that its range extends at least

into Southern New England. My specimens have been verified at the Gray Herbarium. — R. W. Woodward, New Haven, Connecticut.

Sargent's Manual of the Trees of North America. — Any one who has consulted Professor Sargent's *Silva of North America*, or who has had to make shelfroom for it, need not be told of the author's large way of looking at things and of doing things. Over its countless folio pages are spread the details of "the information concerning the trees of North America which has been gathered at the Arnold Arboretum," — that storehouse and headquarters of knowledge of the trees of the world.

Realizing the comparative inaccessibility of the fourteen folio volumes to students of our trees, Professor Sargent has recently put forth a manual[1] in which, as his preface declares, he has tried to bring this information into convenient form. Students everywhere must be grateful for this attempt, but yet their gratitude will not be unmixed with disappointment and dismay. For the manual is as large as many dictionaries, — as big, at least, as a "Webster's Abridged," and its price is — to say the least — inconsiderately high. Compared in size and price with the Silva, the manual is, to be sure, Lilliputian, if we may use this term somewhat in a Brobdingnagian sense.

In its rising eight hundred pages there is condensed an enormous amount of information, but at first sight, as compared with the Silva, the condensation seems to be due rather to a shrinkage of the pages and of the type than to any sacrifice of words. Of these there is a plenty. Merely the diagnosis of the genus Crataegus, for instance, takes between five and six hundred words. Asa Gray in his manual did it in forty-seven, though we must admit that much additional information in regard to this genus has been collected since Gray's time.

Some of the space needed for this over-conscientious completeness is gained by what to the ordinary student is a deplorable omission.

[1] Manual of the Trees of North America (exclusive of Mexico), by Charles Sprague Sargent, with illustrations by Charles Edward Faxon. Boston and New York, Houghton, Mifflin and Company, 1905, pp. 826. Price $6.00 net.

Who but a professional botanist, or one of the new school as regards nomenclature, will be able to recognize even common trees in the absence of synonymy? Even if we may admit that students fortunate enough to pursue their studies in the grounds of the Arnold Arboretum will not be disconcerted, in the presence of the familiar tree, to see *Carya alba* labeled *Hicoria ovata*, can we suppose that more than one student in a hundred, looking for the description of *Ulmus racemosa* will, even after some diligence, recognize it as *Ulmus Thomasi*?

But perhaps these remarks are beside the point. The question is, what will the student find in the book? The minutest, fullest details as to the characteristics in trunk, in branch, in twig, in leaf, in flower, in fruit, of every tree hitherto observed in all the length and breadth of North America, exclusive of Mexico; an account also of its climatal and geographical range; and last and best pen drawings to the number of six hundred and forty-four by the accurate hand of Charles Edward Faxon. "In them," as the author says, and we are inclined to agree with him, "will be found the chief value of this manual."

Polygonum exsertum in Massachusetts. — *Polygonum exsertum* Small has been collected several times along the Charles River in Boston, Massachusetts, associated with *Aster subulatus* Michx. After frost this species is rendered somewhat conspicuous by the reddening of the foliage and sepals. Where it grows in dry soil it is reduced in size and has smaller fruit. Mature achenes from a plant less than a foot high were only three millimeters long. Specimens examined: *A. S. Pease*, no. 482, Sept. 27, 1900, (Hb. Pease); *A. H. Moore*, no. 1539, Nov. 10, 1903, (Hb. Moore); *H. H. Bartlett*, Oct. 26, 1904, (Gray Hb. and Hb. Bartlett). — H. H. Bartlett, Cambridge, Massachusetts.

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LETTER OF DR. ASA GRAY TO LEWIS D. DE SCHWEINITZ.

THE following unpublished letter was written by Dr. Gray while he was teaching in Bartlett's School in Utica, New York, and is among the earliest of his botanical letters. It may be of interest to the readers of RHODORA as showing his early enthusiasm and aspirations. I am indebted to Dr. George de Schweinitz, a grandson of Lewis de Schweinitz, for the privilege of examining some of his grandfather's correspondence and of publishing such of it as seems desirable. There was an appendix to the letter containing a closely-written list of about 300 species of desiderata. De Schweinitz died in February of 1834, and this is the only letter from Dr. Gray which I have found amongst the correspondence.— C. L. SHEAR, Washington, D. C.

Utica, March 8th, 1833.

Dear Sir

Your kind and very acceptable letter of Decr. 30th has but just reached me owing to some mistake at the Post office. It reached me just as I had finished my chemical course and was about making arrangements for the Botanical campaign of the ensuing summer.

I thank you for the honor you do me in giving my name to that beautiful Carex I supposed to be C. livida. I had supposed it to be an undescribed species for some time. I sent it to Dewey with some other Carices last fall labelled *Carex livida*? He gave no opinion but sent me Wahl & Willd.'s description. The character of the remote or sub-radical lower Pist. spike mentioned by Willd. &c does not exist in our plant. It differs in the mode of growth as well as other

characters from *C. livida* — it is not caespitose. It was found in a sphagnous swamp. June. growing with *C. teretiuscula* and *sterilis*.

Carex alba var. setif. Dewey. Dewey informed me a year since he thought it a distinct species.

I shall be able & very happy to furnish you with specimens of most if not all the plants you selected from my list, tho' of some I have not a very good supply now on hand, and I shall either send you a small package in the spring or a very large one in the fall or sooner.— Many of those in the list were not fr. this vicinity. Some were collected in the pines and barrens of N. Jersey in Sept. last.— I am happy to inform you that I intend to spend, if my life in spared, a month or so in the southern part of N. Jersey in Aug. and Sept. next & I mean to explore that country thoroughly. Those you underlined are all found in this vicinity except *Cyperus setifolus*. *Nasturtium natans* De Cand. I discovered in Oneida Lake in 1831 — poor specimens — shall get better ones soon.
I have a Myriophyl. from Niagara falls, which I think is either M. *heterophyllum* or a new one — shall send it to you. I thank you much for your offer to send me a package.— I send a list of my *desiderata* (in Torrey — Flora & Compend.) in N. & Mid. States, doubtful species excluded, by which you will perceive that my Herbm. is yet very imperfect. Of plants of the Southern States I have few indeed. For any plants in the list or what you please I shall be very grateful. I hope I may meet with some of your *desiderata* one of these days — in such case I should consider myself doubly fortunate in being able to supply you and myself. I do not know which would please me most. I have lately received some good plants from Michigan Ter. such as Carex longirostris (very old) Koeleria orthostachya Tor. *ined.* Tofieldia glutinosa Mx. Houstonia tenerifolia *Nutt*? Enonymus atropurpureus, Lythrum hyssopifolium, Hydrophyllum appendiculatum, Monarda ciliata var. *Potentilla confertiflora* one specimen (I expect more) &c. all of which will find a place in my next package. I find my ardor for Botany increasing rapidly, and I mean to collect very extensively the ensuing spring and summer.— I have been thinking of attempting the study of the Genus Salix — (of which I now know nothing) that is, if you would advise it and think anything can be done with our species. Can you send me authentic specimens of any North American species? —
— — — — —

You probably have frequent opportunities of sending to New York. A package for me may be left in charge of my friend *Franklin Brown*, Esqr. 27. *Beekman St.* who will have frequent opportunities of forwarding it to me during the months of April & May.—
I will send to you. unless you otherwise order. through the Revd. Mr. Van Vleck. With many thanks for your kindness and good wishes I remain

Dear Sir
Yours very respectfully
Asa Gray.

P. S. Your letter was directed to me as the Revd. A. Gray which was probably a "lapsus pennae," and was the reason why it was mislaid at the Post office and did not reach me in due season. Tho' not in practice I belong to the medical profession.

A. G.

THE YELLOW-FRUITED VARIETY OF THE BLACK RASPBERRY.

W. H. Blanchard.

The interesting yellow-fruited form of *Rubus occidentalis*, L. was well known to our horticulturists long before our botanists knew it, as were several species of blackberries and the hybrid raspberries. Beyond the few very recent specimens mentioned below I have not been able to learn of it in any herbarium.

The first mention I can find of it was in 1833, when William Kenrick,[1] after naming varieties of *Rubus Idaeus*, L., then in cultivation, speaks of the "Black American Raspberry" and "White American Raspberry" as being "quite distinct from the above." I have not searched agricultural and horticultural periodicals but have examined all the books I could find bearing on the subject. It is next mentioned in 1845 by A. J. Downing.[2] Having noticed the "American Black Raspberry" he mentions this. "The American

[1] New American Orchardist, Boston, 1833, Ed. 1, p. 342.
[2] Fruit and Fruit Trees of America, N. Y., 1845, Ed. 1, p. 516.

White resembles the foregoing in all respects except the color of its fruit which is pale yellow or white." In 1867, Dr. Asa Gray[1] in describing *Rubus occidentalis* says: "Fruit purple-black (rarely a whitish variety)."

In 1867, also, Andrew S. Fuller[2] wrote of it the only good account I have found, and it is well worth being recorded in a botanical journal.

"American White Cap. *Yellow Cap*, *Golden Cap*. Fruit one-half to five-eighths of an inch broad, slightly oval; grains larger than in the preceding variety (American Black Raspberry); pale or deep yellow, covered with a white bloom; sweet, juicy, rather musky, but agreeable; canes light yellow, slightly glaucous; only moderately productive. This variety is also found wild from Maine to the Mississippi River and probably further west. I have received it from nearly all the Northern states and from the southern portion of the State of Delaware. It is seldom found in any great number, and this is probably one reason why so many people have supposed they had discovered something new when they had accidentally found one of these plants growing wild. Nearly every season I receive letters from different parts of the country, describing a new and remarkable wild variety of white raspberry, but when the plants are received they have invariably proved to be this variety. The habit of the plant is as good as could be desired, producing no suckers, but propagating from the tips of the young canes."[3]

Prof. L. H. Bailey[4] in 1898 closed his description of *R. occidentalis* with a brief account of this plant. "Amber-fruited forms of the black cap are occasionally found in wild areas." And in 1902 in his latest contribution on this genus[5] he advances a step. "Var Pallidus has amber-yellow fruit, sometimes found in the wild." So at last this variety has received a botanical name; but, as *pallidus* has already been used at least twice in this genus the writer proposes a new name.

This amber-fruited plant seems to be a good variety but a variety

[1] Manual, Ed. 5, 1867, p. 157.

[2] Small Fruit Culturist, N. Y., 1867, Ed. 1, p. 142.

[3] Note that Mr. Fuller did not call them *sterile* canes.

[4] Evolution of our Native Fruits, N. Y., 1898, p. 289.

[5] Cyclopaedia Am. Hort., N. Y., 1902, Vol. 4, p. 1582.

only. It is very distinct from the western *R. leucodermis*, Douglass which is at best a very weak species. Having examined a good deal of herbarium material and read several accounts of this western plant by those who have seen or known it in its native haunts, I think Card's[1] disposition of it is correct and quote Bailey's[2] description of it which may be compared with Fuller's description of the yellow-fruited form. "Var. LEUCODERMIS, Card (*R. leucodermis*, Douglass). Leaflets more coarsely serrate-dentate, sometimes nearly incise-serrate, the prickles strong and more hooked: fruit reddish black or black. Rocky Mts. and West."

Card[3] gives thirteen horticultural varieties of the Yellow Cap most of them being taken from Crozier's list.[4] Most of them were wildlings. The cultivated forms have never proved to be as fruitful nor as fine-flavored as some of the Black Caps and few are in cultivation at present. I have found a few people who have seen it wild. The writer found it July 19, 1902, on the farm of Mr. Joseph Farwell near Amsden in Weathersfield, Vermont, about two miles southwest of Mt. Ascutney. It was well spread over an acre or more in the road, in mowing and pasture. Inquiry proved that it had been well known to the owner of the farm from the beginning of his occupancy of thirty years, and there was no reason to believe that it was ever cultivated in that section. Specimens are in the Gray Herbarium and that of the New Jersey Botanical Garden. It is interesting here to note that Mr. O. P. Fullam, now of Westminster, Vermont, found it on Hawk Mt. about seven miles southwest of my Amsden station about thirty years ago.

Mr. L. P. Sprague of Burlington, Vermont, found it in Burlington in 1901 in a place that led him to suspect that it probably grew from a seed dropped by a bird. Mr. L. R. Taft now Horticulturist at the Michigan Agricultural College reports that he has found it in several places in Massachusetts and Michigan, — single plants which suggested to him a similar origin. Prof. C. H. Peck, State Botanist of New York found an isolated specimen in 1902 in the road near Albia, Rensselaer Co., New York, a specimen of which is preserved.[5]

[1] Card, Bush Fruits, N. Y., 1898, p. 319.

[2] Cyclopaedia Am. Hort., N. Y., 1902, Vol. 4, p. 1582.

[3] Bush Fruits, pp. 161–176.

[4] Crozier, Bull. 111, Mich. Exp. Sta.

[5] N. Y. State Museum Bul. 67, May 1903, p. 32.

Rubus occidentalis, L., var. **flavobaccus**, n. nom. Var. *pallidus*, Bailey, *White American Raspberry*, Kenrick, *Yellow Cap*, *White Cap*, *Golden Cap*, *Summit*, etc., of horticulturists.— Differs from the species in having pale yellow, light yellow or amber-yellow fruit. From Maine to the Mississippi River, Delaware and Kentucky. Known to horticulturists previous to 1833. Occasional throughout.

Westminster, Vermont.

THE GENUS ARNICA IN NORTHEASTERN AMERICA.

M. L. Fernald.

Arnica is a genus of mostly high-northern and montane plants reaching its greatest development in the mountains of western North America. There the species are perplexingly numerous: but in the eastern portion of the continent only three species have been generally recognized,— the unique *A. nudicaulis* of the southern coast, the familiar plant of northern New England and adjacent Canada which has passed as *A. Chamissonis*, and the Labrador *A. alpina*. Several recent collections in northern New England, eastern Canada, and Labrador, show that we have on our mountains and northern river banks a greater development of the genus than has been imagined. Owing to the established conviction that one uniform species extends from the Gulf of St. Lawrenee to the White Mountains, the Adirondacks, and Lake Superior, the available collections of the genus are very inadequate; and doubtless many other species will be found, especially on the mountains and cliffs of eastern Quebec. The following synopsis of the northeastern species, so far as yet known may serve as a basis for further study of these attractive plants.

* Basal leaves tapering to the petiole.

\+ Leaves entire or with few irregular scattered teeth.

++ Stem pubescent throughout.

= Involucre, conspicuously villous-lanate at base.

A. alpina, Olin & Ladan. Stem 0.5–2.3 dm. high, sparingly villous below, densely so above, copiously villous-lanate at tip: leaves

more or less villous, linear-lanceolate to narrowly ovate; the basal 3–9 cm. long, narrowed to winged petioles; cauline 1 to 3 pairs, sessile, the lowest usually much larger than the upper: head solitary (rarely 3), 3.5–5 cm. broad: involucre densely lanate at base, sparingly villous and viscid-puberulent above; the usually purple-tinged lanceolate long-acuminate bracts 1.2–1.5 cm. long: rays 10 to 15, prominently 3-toothed: achenes hirsute: pappus barbellate, cream-white or slightly sordid.— Diss. 11 (1799), according to Ind. Kew.; Fries, Summ. Veg. Scand. 186 (1846); Lange, Consp. Fl. Groen. 103 (1880); Gray, Syn. Fl. i. pt. 2, 382 (1886), in part; Britton & Brown, Ill. Fl. iii. 472 (1898) in part; Britton, Man. 1023 (1901). *A. montana, B. alpina*, L., Sp. 884 (1753). *A. angustifolia*, Vahl, Fl. Dan. ix. t. 1524 (1818).— Arctic and alpine Europe: Greenland: GRINNELL LAND (*A. W. Greely*, no. 22): LABRADOR, Ekontiarsuk, Cape Chudleigh (*C. Schmitt*, no. 312); Hebron (*Mentzel*).

= = Involucre uniformly villous throughout.

A. **Sornborgeri.** Stem 2 dm. high, viscid-villous throughout, more densely so above: leaves glandular-puberulent and viscid-villous, linear to lanceolate; the basal 6 or 7 cm. long, narrowed to slender petioles; cauline 4 pairs, sessile, with scattered reduced bracts above, entire or remotely and irregularly short-dentate: head solitary, 4–5 cm. broad: involucre uniformly viscid-villous; the linear- to lance-attenuate purple-tipped bracts 1.2–1.4 cm. long: rays about 15, sharply 3-toothed: achenes hirsute: pappus barbellate, cream-white. — *A. alpina*, var. *Lessingii*, Fernald & Sornborger, Ott. Nat. xiii. 106 (1899), in part, not Gray.— LABRADOR, banks of mountain brook, at 100 m. altitude, Ramah, August 20–24, 1897 (*J. D. Sornborger*, no. 157, in part). Habitally resembling *A. alpina*, but with shorter more viscid pubescence which does not become at all lanate at the base of the involucre, and with slender-petioled basal leaves.

++ ++ Stem essentially glabrous below.

A. PLANTAGINEA, Pursh. Stem 2–4.5 dm. high, minutely and sparingly villous-hispid or glabrous below, glandular-puberulent above, becoming sparingly villous at tip: leaves lanceolate to oblong, entire, glabrous or sparingly pubescent on the nerves and margin; the basal slender-petioled, 6–10 cm. long; the cauline 2 to 4 pairs, sessile and reduced upward, the peduncles sometimes with small scattered bracts:

heads 1 to 3, apparently 3–5 cm. broad: involucral bracts glandular-villous at base, ciliate on the margin, otherwise sparingly puberulent or glabrate, oblanceolate, acuminate, about 1 cm. long: rays 10 to 15, 3-toothed: achenes hispid: pappus barbellate, cream-white. — Fl. 527 (1814). *A. angustifolia*, Torr. & Gray, Fl. ii. 449 (1843), in part, not Vahl. *A. alpina*, Gray, Syn. Fl. i. pt. 2, 382 (1886), in part, not Olin. *A. alpina*, var. *Lessingii*, Fernald & *Sornborger*, l. c., in part, not Gray.— Labrador, described from material collected by *Colmaster*; banks of a mountain brook, at 100 m. altitude, Ramah, August 20–24, 1897 (*J. D. Sornborger*, no. 157, in part); Nain (*Sandberg*).

+ + Leaves prominently and regularly dentate.

++ Pappus barbellate, white or whitish.

= Pappus bright white.

A. **chionopappa**. Stem 0.7–3.5 dm. high, villous throughout with flat white hairs: leaves 3 to 5 pairs, lanceolate to narrowly ovate, thin, serrate-dentate, sparingly villous or glabrate, mostly confined to the lower half of the stem; the basal 0.5–1.3 cm. long, on very long slender petioles; the lower cauline petioled, the upper sessile and much reduced: peduncles 0.5–1.5 dm. long, bracteate, 1–3-flowered: head 3–4 cm. broad: involucre villous throughout, densely so at base; the linear- or lance-attenuate bracts 7–10 mm. long: rays 10 to 15, bluntly 3-toothed: achenes 3.5–5 mm. long, densely setulose; the ascending white setae barely one-half the diameter of the achene: pappus bright white, in fruit 5–6.5 mm. long.— Quebec, wet calcareous banks of the Grand River, Gaspé Co., in anthesis, June 30–July 3, 1904 (*G. H. Richards & M. L. Fernald*); wet cliffs at 500–550 ft., Grande Coupe, Percé, old fruit, August 19, 1904, Bonaventure River, fruit, August 5–8, 1904 (*Collins, Fernald & Pease*): New Brunswick, Sisson Gorge, Tobique River, July 25, 1900 (*G. U. Hay*, no. 72). A beautiful species characteristic of the calcareous cliffs of northern New Brunswick and the Gaspé Peninsula. Nearest related to *A. arnoglossa*, Greene, of the Black Hills, but differing in its thinner slender-petioled basal leaves, its more villous stem, and its villous involucre.

= = Pappus cream-white.

A. **gaspensis**. Stems 3–4 dm. high, villous below, glandular-

puberulent above: leaves 5 pairs, thick, lanceolate with sharp spreading teeth, slightly pilose on both surfaces, the lower pairs with broad-winged petioles, the upper sessile: the 3 heads, 4–5 cm. broad, on naked or bracted glandular-puberulent peduncles (1–1.5 dm. long): involucre glandular-puberulent and sparingly pilose; its oblong bracts 1 cm. long, with triangular ciliate-pilose tips: rays about 10, sharply 3-toothed: achenes 6–7 mm. long, hirsute with short and long hairs, the latter equalling the diameter of the achene: pappus cream-white, 8–10 mm. long.— *A. Chamissonis*, form, Gray, Syn. Fl. i, pt. 2, 382 (1886).— QUEBEC, very precipitous ledges of a hill at Cap Tourelle, near Ste. Anne des Monts, Gaspé, Co., July 14, 1881 (*J. A. Allen*).

++ ++ Pappus plumose, sordid.

A. MOLLIS, Hook. Stem 1.5–7 dm. high, more or less crisp-villous throughout, somewhat glandular above: leaves oblanceolate to ovate, mostly dentate, thin, sparingly pilose; the basal slender-petioled; the cauline (3–5 pairs) mostly sessile, 0.3–1.5 dm. long, the uppermost only slightly smaller: heads 1 to 9, on short (3–12 cm. long) naked or rarely bracted glandular-villous peduncles, 4–6 cm. broad: involucre glandular and villous throughout, densely so (almost lanate) at base; its lance-attenuate often purple-tipped bracts 1–1.6 cm. long: rays 10 to 15: achenes hirsute, 4–5 mm. long, shorter than the plumose yellow-brown or olive-tinged pappus.—Fl. Bor.-Am. i. 331 (1834); Torr. & Gr., Fl. ii. 450 (1843); Gray, Man. 241 (1848), ed. 3, 231 (1862), excluding Lake Superior plant. *A. lanceolata*, Nutt. Trans. Am. Phil. Soc. n. s., vii. 407 (1841); Britton, Man. 1023 (1901), excluding Lake Superior plant. *A. Chamissonis*, Gray, Syn. Fl. i. pt. 2, 381 (1886); Wats. & Coult. in Gray, Man. ed. 6, 292 (1890); Britton & Brown, Ill. Fl. iii. 472 (1898); in part, not Lessing. *A. Chamissonis*, var. *longinodosa*, A. Nelson, Bot. Gaz. xxx. 199 (1900). — QUEBEC, Thickets, Table-top Mt., Gaspé Co. (*J. A. Porter*); banks of the River Ste. Anne des Monts, Gaspé Co. (*J. A. Allen*); ledges of Little Cascapedia River (*Collins, Fernald, & Pease*); Somerset, Megantic Co. (*Ovide Brunet*): MAINE, mouth of Allaguash River (*D. W. Fellows*); wet cliffs, Mt. Katahdin (*Scribner, et al*): NEW HAMPSHIRE, White Mts. (*Oakes*); Oakes Gulf (*Faxon, et al*); Tuckerman's Ravine (*Farlow, et al*): Alberta and British Columbia, south to Colorado and California.— A specimen in the Gray Her-

barium of Hooker's own material of *A. mollis*, sent to B. D. Greene, leaves no question that the northeastern plant is identical with the Rocky Mountain species. There is, however, little question that it is distinct from *A. Chamissonis* to which it was referred by Dr. Gray. The latter Alaskan plant is much more pubescent, but less glandular, with less attenuate involucral bracts, less pubescent achenes, and barbellate rather than plumose pappus.

Var. **petiolaris**. Leaves narrow, oblanceolate, all but the very uppermost tapering to slender petioles: heads 3–4 cm. broad: involucral bracts scarcely 1 cm. long.— *A. mollis*, Torr. Fl. N. Y. i. 403, t. 60 (1843); Goodale, 2d Am. Rep. Nat. Hist. & Geol. Me. 123 (1862). *A. Chamissonis*, form, Gray, Syn. Fl. i. pt. 2, 382 (1886). Maine, in spray, Moxie Falls, Somerset Co., 1862 (*G. L. Goodale*); bank of a mountain-brook, Rangeley, July 28, 1879 (*Ralph W. Rounds*): New Hampshire, Mill Brook, Shelburne, August 2, 1884 (*W. Deane*); Gobilldunk Ravine, Mt. Moosilauke, August 26, 1898 (*W. W. Eggleston*): New York, Essex Co. (Torrey, l. c.).

* * Basal leaves rounded or cordate at base.

A. cordifolia, Hook. Stem 1.5–6 dm. high, more or less villous throughout, glandular above: basal and lower cauline leaves ovate, coarsely dentate, rounded or cordate at base, slender-petioled; upper short-petioled or subsessile: heads 1 to 8, slender-peduncled, 5–7 cm. broad: involucre villous, especially at base; its lanceolate to oblong acuminate bracts 1.3–2 cm. long: rays about 15: achenes hirsute: pappus white, barbellate.— Fl. Bor.-Am. i. 331 (1834); Torr. & Gr., Fl. ii. 450 (1843); Gray, Syn. Fl. i. pt. 2, 381 (1886); Britton & Brown, Ill. Fl. iii. 471, fig. 4025 (1898). *A. mollis*, Gray, Man. ed. 3, 231 (1862), as to Lake Superior plant, not Hook. *A. Chamissonis*, Gray, Syn. Fl. i. pt. 2, 381 (1886); Wats. & Coult. in Gray, Man. ed. 6, 292 (1890); Britton & Brown, Ill. Fl. iii, 472, (1898), as to Lake Superior plant, not Lessing. *A. lanceolata*, Britton, Man. 1023 (1901), as to Lake Superior plant, not Nutt.— Yukon to South Dakota, Colorado, Utah, Nevada, and California: Michigan, Copper Harbor, Keweenaw Co., 1849 (*J. D. Whitney*).

Gray Herbarium.

SPERGULA SATIVA IN CONNECTICUT.

M. L. Fernald.

Dr. C. B. Graves has sent to the Gray Herbarium a specimen of *Spergula sativa*, Boenn., collected in a cultivated field at New London, Connecticut, June 11, 1903. So far as I am aware this is the first occurrence of the plant in the United States although it is superficially so near the commonly established *S. arvensis*, L., that it has possibly escaped detection. In fact, the plant collected at Ottawa, Canada, in July, 1892, by Mr. J. Fletcher and distributed as *S. arvensis* (no. 115) in Halsted's American Weeds is very characteristic *S. sativa.*

In Europe there are several closely related species of *Spergula* differing in seed characters and geographic ranges; and since the status of *S. arvensis* and *S. sativa* has been very fully discussed by certain European authors it is well here to review the results of these studies. For some time the two plants, one with the seeds more or less covered with white papillae, the other with seeds quite without papillae, were not distinguished. In 1824, however, Boenninghausen[1] divided the so-called *S. arvensis* into two species, *S. sativa* with smooth seeds, and *S. vulgaris* with papillose seeds. These two plants have been regarded sometimes as species, sometimes as varieties; and by many continental and some British botanists the smooth-seeded plant was long supposed to be the true Linnean *S. arvensis.*

This view was still current in 1880, when Mr. George Nicholson[2] called attention to the occurrence of the two plants in Britain, and showed that the papillose seeded plant (*Spergula vulgaris*, Boenn.) was of broad distribution over continental Europe, though rare in the British Isles, and that it was the only species established in America. *S. sativa*, according to Mr. Nicholson, is a more northern plant, common in Britain and Scandinavia, but less common in central and southern Europe. This northern plant, *S. sativa*, "has minutely punctulate, margined seeds, and in a living state can be distinguished by its decidedly viscous, dull grey-green leaves and branches; on the other hand, in *S. vulgaris* the seeds are obscurely margined, or totally

[1] Prodr. Fl. Monast. 135 (1824). [2] Journ. Bot. xviii. 16–19 (1880).

devoid of wing, and beset with club-shaped papillae, generally quite black in fully-matured seeds. When growing the latter is conspicuous on account of its light grass-green leaves, altogether brighter-looking and less viscid than the former plant." [1]

In 1891, Mr. G. Claridge Druce,[2] the discriminating curator of the Fielding Herbarium at Oxford, showed that in the Linnean Herbarium "the only specimen labelled *S. arvensis* is quite typical *S. vulgaris* Boenn., as is the specimen in *Hort. Cliff.* The Morisonian plant is also *S. vulgaris.*" Thus, from Mr. Druce's studies, there is no question that the papillose-seeded plant, now so commonly established in America, is the true *S. arvensis* of Linnaeus. Mr. Druce reiterates the statement of distribution previously made by Mr. Nicholson and in regard to the viscid character of *S. sativa* says further: "The difference in the relative viscoscity of *S. sativa* and *S. vulgaris* was strongly impressed upon my mind in September last, when I found *S. sativa* (accompanied with *S. vulgaris*) for the first time in Berks in a sandy field on Boars Hill, near Oxford, growing with many plants of *Senecio Jacobaea*. It was a singular fact that plants of *S. sativa* might be picked out from those of *S. vulgaris* [*S. arvensis*], from their being more or less covered with the pappus of the *Senecio* which in its wind-driven progress across the field became attached to *S. sativa*, but which the less viscid foliage of *S. vulgaris* [*S. arvensis*] did not retain." Later, in 1897, Mr. Druce said "The flowers of *S. sativa* have a valerianaceous odor which I have not noticed in *S. vulgaris* [*S. arvensis*], but I by no means assert that it is not present in the latter." [3]

The appearance in Connecticut and formerly at Ottawa of the smooth-seeded highly viscous *Spergula sativa* of northern Europe suggests that it may occur in other parts of the Eastern States and Canada; and it is hoped that the foregoing notes derived largely from European sources may be of service to those who watch for the plant in America.

Gray Herbarium.

[1] Journ. Bot. l. c. 17.
[2] Jour. Bot. xxix. 173–175 (1891).
[3] Druce, Fl. Berks. 102 (1897).

The Essex Institute of Salem, Massachusetts, has issued a notice of "meetings for the exhibition and study of Fungi" to be held at the Institute on July 17, August 29, September 5, 11, 18, and 25. These dates fall on Mondays, except September 5, which is Tuesday. "All who are interested in Edible and Poisonous Mushrooms are invited to attend, and to send for exhibition" any specimens that are complete and in a good state of preservation.

The committee in charge consists of Richards B. Macintosh, of Peabody, and Willis H. Ropes of Salem. Authorities on mushrooms are expected to speak at these meetings.

It is interesting to see others following the example set for a number of years by the Boston Mycological Club, whose exhibitions of named fungi are again this year a regular feature on Saturdays at Horticultural Hall from July to November.

SOME LITHOLOGICAL VARIATIONS OF RIBES.

M. L. Fernald.

The common gooseberry of eastern New England and the Maritime Provinces, *Ribes oxyacanthoides*, L., is a more or less prickly shrub, with the mature fan-shaped leaves of the fertile branches mostly cuneate or truncate at base, dark green and glabrate above, light green and only slightly villous on the veins beneath. The species is common in the coastal district either in swamps or in dry or rocky soil, and it extends inland as a somewhat local shrub throughout New England, west beyond the Great Lakes, and north to Hudson Bay. Its greatest development is apparently in the coastal area from southern New England to Newfoundland and eastern New Brunswick. In the southern half of Gaspé Peninsula in eastern Quebec the common New England form of the plant is apparently very rare; extended explorations along the Baie des Chaleurs, eastward to Gaspé Basin, and inland from fifteen to thirty miles along the larger rivers, showing the shrub to be probably absent from the great calcareous region (Lower Carboniferous and Silurian) which extends over most of the county of Bonaventure and

the southern part of the county of Gaspé. A single station only has been noted in the former county, a small clump of bushes on the "common" at New Carlisle, a district covered with white sea-sand rather than the red calcareous soil of the surrounding country.

In eastern Gaspé County, however, the limestones and calcareous slates of the Silurian and the strongly calcareous red conglomerates (Bonaventure conglomerates) of the Lower Carboniferous areas give way very largely to the non-calcareous dark sandstones and shales of the Devonian system; and the vegetation from Malbaie to the mouth of the Dartmouth River (and probably beyond) becomes essentially that of eastern New England. There, in an area notable from the presence of such plants as *Picea nigra*, *Nemopanthus fascicularis*, *Typha latifolia*, *Prenanthes trifoliolata*, *Geum virginianum*, *Luzula campestris*, var. *multiflora*, and many other characteristic species of eastern New England and New Brunswick, which are rare or unknown on the calcareous soils of Gaspé Peninsula, the ordinary type of *Ribes oxyacanthoides*, with leaves only slightly pubescent, is common, and it is probable that it occurs on the broad Devonian upland which occupies the center of the Peninsula.

Throughout the great Silurian and Lower Carboniferous areas which lie south of the central Devonian upland of Gaspé Peninsula typical *Ribes oxyacanthoides*, as already stated, is apparently absent, though it occurs locally on the sand dunes of New Carlisle, and probably on other dunes and beaches. Associated, however, with such lime-loving plants as *Carex livida* and *C. vaginata*, *Rhynchospora capillacea*, *Juncus Stygius*, var. *Americanus*, *Tofieldia glutinosa*, *Salix candida*, *Pinguicula vulgaris*, and *Senecio discoideus*, in the damp arbor-vitae forest and about the numerous marly ponds which characterize the Silurian and Lower Carboniferous districts, there is a smooth-fruited gooseberry which in leaf-outline and habit suggests *Ribes oxyacanthoides*, but which has the lower surface of its mature leaves so copiously soft-villous as to be grayish-white or silvery, while the pilose upper surfaces are dull pale green. This handsome shrub with the permanently villous lower leaf-surfaces was found by Messrs. J. F. Collins, A. S. Pease, and the writer in essentially all arbor-vitae swamps and on the margins of marl-ponds and occasionally on damp calcareous cliffs, from Carleton, near the head of the Baie des Chaleurs, to Percé, at the tip of the Peninsula. Confined to the strongly calcareous soils, where it fruits profusely, this shrub

was found venturing nowhere from the conditions which best suit it, though on cliffs at the summit of Tracadigash Mountain, a ragged trap ridge rising out of the calcareous tableland to a height of about 2000 feet above the Baie des Chaleurs, the bushes were poorly developed and mostly sterile.

In its leaf-outline, fruit and shriveled flowers, as well as in the character of its bark and prickles, this very pubescent shrub of southern Gaspé Peninsula is essentially identical with *Ribes oxyacanthoides*, and the only character which seems to distinguish it clearly is the extreme development of pubescence on its foliage. This character, however, is so constant over a broad and clearly marked geological area that the plant is of special interest as an extreme which may be called

Ribes oxyacanthoides, L., var. **calcicola**. Resembling the species, but young branches, petioles, and lower leaf-surfaces permanently and densely white tomentose.— Calcareous soils of Bonaventure and Gaspé Counties, Quebec: Arbor-Vitae swamp, Carleton, July 27, 1904, trap cliffs near summit of Tracadigash Mt., July 24, 1904, Arbor-Vitae swamps at the mouth of the Bonaventure River, August 2, 1904 — **type** (*J. F. Collins, M. L. Fernald & A. S. Pease*); also noted in similar habitats at New Richmond, Grand River, and Percé, and upon the Little Cascapedia and Dartmouth Rivers. A flowering specimen from Mackinaw, Michigan (*Loring*) in the Gray Herbarium may belong here.

A striking difference in the degree of pubescence, suggesting that shown in *Ribes oxyacanthoides*, is found also in *R. Cynosbati*. In New England and Eastern Canada, at any rate, the latter shrub, with permanently soft-pubescent leaves and spiny berries, abounds in the interior strongly calcareous regions, where the smooth-leaved typical *R. oxyacanthoides* is rare, but from the non-calcareous regions near the coast and in central and eastern Maine and the Maritime Provinces it is quite absent. This typical form of *R. Cynosbati*, with soft-pubescent leaves extends through the St. Lawrence basin to the Great Lakes and beyond, and southward in the Eastern States. An extreme with leaves quite as glabrate as in true *R. oxyacanthoides* is found on the south shore of Lake Erie and on the slopes of some of the higher Alleghanies. Whether this smooth-leaved extreme is, like the typical smooth-leaved *R. oxyacanthoides*, confined primarily to the less calcareous soils, the data at hand do not clearly show; but the very glabrate phase of the plant seems worthy distinction as

Ribes Cynosbati, L., var. **glabratum**. Leaves pubescent only with scattered hairs, becoming glabrate in age.— Virginia, northeast slope of White Top Mountain, Smyth County, altitude 4000–5000 feet, May 28–29, 1892 (*J. K. Small*): North Carolina, slopes of Mt. Mitchell, August 8, 1897 (*Biltmore Herb.*, No. 3252b): Ohio, Painesville, 1871 (*H. C. Beardslee*); Oberlin, June, 1894 (*Hicks*).

Gray Herbarium.

A second Vermont Station for Arenaria macrophylla. — *Arenaria macrophylla* was found by a road-side in the western part of Newfane, Vermont, on May 22d, in both bud and blossom. It was growing in coarse pebbly soil on the high bank which formed the southern side of the road, consequently with not much direct sunshine, in the partial shade of low trees of various kinds. It was apparently well established and from the scattered plants in its locality of perhaps six feet square evidently spreading. — S. J. Ballard, Newfane, Vt.

Anaphalis margaritacea, var. occidentalis in Eastern America.— An abundant plant on some of the gravel bars of the Grand River, in Gaspé County, Quebec, is an *Anaphalis* with the lanceolate long-acuminate leaves bright green and glabrous above. In late June, 1904, when, with Messrs. Louis Cabot and George H. Richards, I examined the plant, it seemed very unlike the narrower-leaved plant with at least the young leaves tomentose above, the common Life Everlasting, *Anaphalis margaritacea*, of New England pastures. The Grand River plant was too immature for identification; but recently Mr. Richards has brought me specimens, nearly in anthesis, collected in July, 1904. These prove to be the northwestern *A. margaritacea*, var. *occidentalis*, Greene, Fl. Fran. 399 (1897), described as "common among sand hills of the seaboard from at least middle California to Alaska." This strongly marked variety is probably of somewhat broad range about the Gulf of St. Lawrence, for it was collected at Channel on the Newfoundland coast in 1901 (*Howe & Lang*, no. 967).— M. L. Fernald, Gray Herbarium.

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NOTES ON THE ACCENTUATION OF CERTAIN GENERIC NAMES.

ARTHUR STANLEY PEASE.

A REVIEW of the accentuation of botanical names as indicated in current American manuals discloses a number of inaccuracies and inconsistencies. While it is not my purpose here to enter upon an exhaustive discussion of these errors, I should like, however, to call attention to a few desirable changes in common pronunciation. To add to the already overwhelming burden of an increasing and frequently changing synonymy any change in the accentuation of familiar names will probably not arouse great enthusiasm among botanists, but to those who believe that whatever the common practice may be, a manual or other botanical text-book should contain the correct pronunciations, so far as they are known, the changes here suggested will not, I hope, seem altogether unwarranted. In this article I shall limit my remarks to generic names, as being of greater difficulty and variety than those applied to species, and shall discuss only certain of the names in the sixth edition of Gray's Manual.

Before attempting to settle the accent of generic names it will be well to ask just what those names are. I shall divide them into the following principal groups, in which nearly all generic names are included.

1. Latin and Greek common nouns, many of them names of plants, though often not of those genera to which they are now applied. Examples are CORNUS, RUBUS, ROSA; ITEA, PTELEA, MYRICA.

2. Mythological names: CASSANDRA, ANDROMEDA, CALYPSO, etc.

3. Names borrowed from other languages than Latin or Greek and more or less Latinized: Berberis, Tecoma, Cabomba, Yucca, Mayaca.

4. Plants named for persons, either by the addition to the person's name (often modified) of *-a*, *-ia*, or by some such suffixed word as *-anthus*.

5. Artificial compounds, invented by the authors, generally from Greek component parts, because of the ease of compounding in Greek, *e. g.*, Sericocarpus, Caulophyllum. These are often carelessly and incorrectly formed. In this sin Linnaeus and Rafinesque are among the chief offenders. Of about nineteen names ascribed by the sixth edition of the Manual to Rafinesque, three are formed from names of persons, one is unexplained, and fifteen are of his own concoction. Of these fifteen, ten are incorrectly formed!

6. Names derived from those of other genera, including anagrams: Trilisa (*Liatris*), Verbesina (*Verbena*), Valerianella, Crotonopsis.

All these names are by common convention put into a form more or less closely approximating to Latin, and are accompanied by adjectives in agreement with them according to Latin rules of gender. From the unity afforded by this thin veneer of Latinity any uniform system of accentuation must take its start. We should therefore enquire upon what principle Latin words are accented. For those whose recollection of Latin accent is less vivid than it once was I will summarize its principal rules.

1. The penultimate syllable of a word if long is accented; if not, the antepenult receives the accent.

2. A syllable is long if it contains a long vowel or a diphthong, or a short vowel followed by *x*, *z*, or two consonants (except a mute or *f* followed by a liquid). Examples:

a) vowel long: Calopògon.

b) diphthong: Suaèda.

c) before *x*: Hypóxis.

d) before *z*: I have noted no instance of this in the Manual.

e) before two consonants: Littorélla, Synándra, Epipáctis. Note that the combinations *ch*, *ph*, *th* (Greek χ, ϕ, θ) each count as a single consonant.

f) before a mute or *f* + a liquid = Brachyélytrum.

As in all these cases except a) the length of the syllables is at

once apparent, the difficulties narrow themselves to those words in whose penults vowels whose quantity is not obvious precede single consonants. The quantity of the penultimate vowels of Latin and Greek words is generally known, either from derivation or from use of the words in poetry. Thus Homer, Iliad xxi. 350, corrects the Manual pronunciation of PTELEA and ITEA and proves that of MYRICA. Words, however, which do not occur in Greek or Latin poetry but merely in prose are sometimes uncertain (eg. CARDAMINE, ELATINE). Uncertainty as to the etymologies of some words (such as VERONICA, ARNICA, ABUTILON) is a great obstacle to the determination of the proper accent. The quantities also of the penultimate vowels of many native words are uncertain and await the attention of persons conversant with the languages from which these names are drawn. In such cases, until positive evidence is forthcoming, a deviation from current usage is undesirable, and indeed we may count ourselves fortunate when usage does not split upon this very point.

In the case of names formed from proper names by the addition of *-a*, it has been a convenient custom arbitrarily to consider penultimate *a*, *o*, or *u* as long and *e*, *i*, or *y* as short: BERTERÒA; MUNROA not *Múnroa* as in the Manual; LISTERA; LÍPPIA; etc.

These preliminary remarks are intended to apply to the so-called 'English method' of pronouncing Latin, so firmly established in this country for scientific names that nothing short of a revolution in pronunciation could supplant it. But while this system differs in the sounds given to various vowels and consonants from other more correct systems its theory of accentuation is in agreement with other methods.

I shall now speak of certain generic names incorrectly accented in Gray's Manual, grouping them in two lists: 1) of names in which the mistaken quantity of the vowel has led to placing the accent on the wrong syllable; 2) of cases in which the accent is placed on the correct syllable but in which the length of the vowel of that syllable is wrongly indicated. For the accented syllables I shall employ the notation used in the Manual, the grave accent ` indicating a long vowel and the acute ´ a short vowel.

1. CAÙCALIS not *Caucàlis*

ERIGENIA not *Erigènia.* From ἠριγένεια, a Homeric epithet of Dawn.

HYPERÌCUM not *Hypéricum*. ὑπέρεικον (cf. ἐρεικη, *erìca*).

MICROSTỲLIS not *Micróstylis*. } στῦλίς
NEMASTỲLIS not *Nemástylis*. }

NOTHOSCÓRDUM not *Nothóscordum*. The penult is long before two consonants.

POLYGÓNATUM not *Polygonàtum*. πολυγόνᾰτον.

STENOSIPHON not *Stenósiphon*.

2. In this list I shall indicate only the *correct* vowel quantities of words which the Manual indicates incorrectly.

ÁBIES
ÁCER
AEGOPÓDUM. So also
CHENOPÓDIUM
LYCOPÓDIUM
THELYPÓDIUM
POLYPÓDIUM
AGRÒSTIS. So also
ERAGRÒSTIS
CALAMAGRÒSTIS
AMBRÓSIA
ARCEUTHÓBIUM
ARISTOLÓCHIA
BÍDENS
BRÓMUS
BUMÉLIA
CASTÁNEA
CHAMAELIRIUM
CLÁDIUM
CLÈMATIS
CRÓTON
CYPRIPÉDIUM
DIÓDIA
EPILÓBIUM
EUPHRÁSIA
GÁLAX
GÁLIUM
GERÁNIUM
GLYCÉRIA
GNAPHÁLIUM
GRATÍOLA
HELÉNIUM
HELIOTRÓPIUM
HYOSCÝAMUS
IMPÁTIENS
ÌTEA
LÁRIX
LĪLIUM
LÓLIUM
MÌMULUS
MITRÉOLA
MODIOLA
ONOSMÓDIUM
OPÙNTIA
PHACÉLIA
PHASÉOLUS
PHLÉUM
PHLÓMIS
PHYSOSTÉGIA
PÍCEA
PÓA
PRÌMULA
PTÉLEA
PTÉRIS
PÝRUS (cf. *Pyrola*)
RHÈXIA

RHÙS
RÓSA
RÚMEX
SÁLIX
SAPÍNDUS
SENECIO
SÍUM
SPARGÁNIUM
STÁCHYS
THÝMUS
TRÒXIMON
UNÍOLA
VACCÌNIUM
VÍOLA
XÝRIS

I will not here take the space to prove all of these pronunciations but will give samples by notes on a few of the more surprising changes.

CLÈMATIS. Greek κληματίς.

EPILÓBIUM. Greek ἐπί + λόβιον.

LÌLIUM. Cf. Vergil, Aen. vi. 708–709: *candida circum lilia funduntur.*

LÓLIUM. Verg. Georg. i. 154: *infelix lolium et steriles dominantur avenae.*

PRIMULA. Diminutive of *prìma.*

VACCINIUM. Verg. Ecl. ii. 18:

alta ligustra cadunt, vaccinia nigra leguntur.

The other cases may be substantiated in these same ways, partly by derivation, partly by poetical use.

In offering this comparatively short list of names I am aware that many others are in as much need of study. Such a study should be undertaken in connection with a review of the derivations of generic names, a field in which there are many doubtful points, of which some will probably never be known. And if to anyone I may seem to be suggesting too violent changes, I should like to say that by adopting them we should be not merely adopting an accentuation which is theoretically correct, but should also be bringing ourselves into uniformity with European botanists to whom *Hypericum*, *Polygónatum*, etc. are the recognized and familiar pronunciations.

ANDOVER, MASSACHUSETTS.

RECENTLY RECOGNIZED SPECIES OF CRATAEGUS IN EASTERN CANADA AND NEW ENGLAND,—VI.

C. S. Sargent.

Tomentosae.

Stamens 20; anthers rose-color or pink.

Crataegus Helenae, n. sp. Leaves broadly ovate to oval, acute or short-pointed and acuminate at the apex, concave-cuneate or rounded at the entire base, finely and often doubly serrate above, with straight glandular teeth, and slightly divided above the middle into 3 or 4 pairs of short acuminate lobes, when they unfold tinged with red, glabrous with the exception of a few hairs along the upper side of the midribs and conspicuously reticulate-venulose, with midribs and veins deeply impressed on their upper side, when the flowers open late in May or at the beginning of June, thin but firm in texture, dark green, smooth and lustrous above and pale or glaucous below, and at maturity coriaceous, dark green on the upper and pale on the lower surface, 5–6 cm. long, 4–5 cm. wide, with stout yellow midribs often rose-colored on the lower side toward the base, and slender yellow primary veins extending obliquely to the points of the lobes; petioles stout, wing-margined at the apex, usually rose-colored in the autumn, 1.2–1.5 cm. in length; stipules linear, acuminate, bright red, mostly deciduous before the flowers open; leaves on vigorous shoots broadly oval to rhombic, short-pointed at the apex, rounded or cuneate at the base, coarsely serrate, often 6 cm. long and 5 cm. wide, with short stout broadly winged dark red petioles. Flowers about 1.5–1.7 cm. in diameter, on elongated slender glabrous pedicels, in usually 12–18-flowered compact corymbs, with oblong-obovate to linear bracts and bractlets glandular, with minute dark red glands, bright scarlet like the large and conspicuous inner bud-scales and mostly deciduous before the flowers open; calyx-tube narrowly obconic, glabrous, dark red in the bud, the lobes slender, acuminate, glandular, with minute stipitate glands, glabrous on the outer and puberulous on the inner surface, reflexed after anthesis; stamens 20, long-exserted; anthers large, dark rose color; styles 2 or 3, mostly 2. Fruit ripening early in September and falling during the month, on slender erect reddish pedicels, in few-fruited clusters, short-oblong, often ovate, full and rounded at the ends, scarlet, very lustrous, translucent, 8–10 mm. long and nearly as broad; calyx little enlarged, with a narrow shallow cavity, and spreading and reflexed lobes villose-pubescent on the upper side and mostly persistent on the ripe fruit; flesh thin, orange color and succulent; nutlets usually 2, broad

and rounded at the base, narrowed and rounded at the apex, ridged on the back, with a low slightly grooved ridge irregularly penetrated on their inner faces by usually large deep cavities, 6–7 mm. long and about 5 mm. wide.

A tree 3–4 m. high, with a tall stem 5–8 m. in diameter covered with dark scaly bark, short thick erect rigid branches forming an open irregular head, and stout slightly zigzag branchlets marked by small oblong pale lenticels, dark orange-green and glabrous when they first appear, becoming light red or purplish and very lustrous in their first season and ultimately dull gray-brown, and armed with stout usually straight purplish shining spines generally pointed toward the base of the branch and 5–6 cm. long.

Rocky hillsides, Wolf Pen Farm, Southborough, Worcester County; Massachusetts, *C. S. Sargent*, May, September and October, 1904.

This handsome plant, which is one of the most distinct of the species of this group and one of the most beautiful of the New England Thorns, is named for Miss Helen Sears of Southborough.

Crataegus pisifera, n. sp. Leaves rhombic to oblong-obovate on vigorous shoots, acute or acuminate, gradually narrowed to the cuneate entire base, finely doubly serrate, above with straight glandular teeth and slightly divided above the middle into numerous short acute lobes, nearly fully grown when the flowers open during the last week of May and then thin, yellow-green, lustrous, smooth and glabrous above with the exception of a slight pubescence along the midribs, and pale and clothed below along the base of the primary veins with short persistent hairs, and at maturity coriaceous, conspicuously reticulate-venulose, dark yellow-green and lustrous on the upper and pale on the lower surface, 5–7 cm. long and 4–5 cm. wide, with stout yellow midribs deeply impressed on the upper side and 5 or 6 pairs of slender primary veins extending obliquely to the points of the lobes; petioles stout, wing-margined to the middle, puberulous on the upper side while young, becoming glabrous, sometimes slightly tinged with rose color, 1–1.5 cm. in length. Flowers 1.3–1.5 cm. in diameter, on slender elongated slightly villose pedicels, in wide compound many-flowered corymbs, with oblong-obovate to linear acute glandular bracts and bractlets fading brown and often persistent until the flowers open; calyx-tube narrowly obconic, the lobes wide, acuminate, incisely glandular-serrate, glabrous on the outer, pubescent on the inner surface, reflexed after anthesis; stamens 20; anthers minute, light pink; styles 2 or 3. Fruit ripening at the end of September and remaining on the branches until the following spring, on slender reddish erect or spreading pedicels, in many-fruited clusters, hard, subglobose, crimson, lustrous, marked by occasional pale dots, 6–8 mm. in diameter; calyx prominent, with a

deep narrow cavity and wide coarsely serrate lobes light red below the middle and pubescent on the upper side, persistent on the ripe fruit; flesh thin, dry and mealy; nutlets 2 or 3, full and rounded at the ends, rounded and ridged on the back, with a broad slightly grooved ridge, irregularly penetrated on the inner faces by broad shallow cavities, 5–6 cm. long and about 4 cm. wide.

A shrub 2–3 m. high, with stout slightly zigzag branchlets marked by large pale lenticels, light orange-yellow and glabrous when they first appear, becoming bright chestnut-brown and very lustrous during their first season and reddish brown the following year, and armed with stout slightly curved purplish shining spines 3.5–4.5 cm. long.

Cornwall, Vermont, *E. Brainerd* (No. 15 d type), May and September 1901, *W. W. Eggleston* (Nos. 2234 and 2323), May and July, 1901.

Well distinguished from the other species of this group by its minute pale pink anthers and small hard long-persistent fruit.

(*To be continued.*)

SYMPHORICARPOS RACEMOSUS AND ITS VARIETIES IN EASTERN AMERICA.

M. L. Fernald.

There are in eastern America three noteworthy variations of the Snowberry, *Symphoricarpos racemosus*, all with the corolla characteristically bearded within and with the stamens and styles included, and seeming referable to one broadly distributed but variable species.

The plant commonly known as *Symphoricarpos racemosus* is an upright shrub with glabrous leaves and often numerous flowers in terminal or axillary spiciform racemes. This plant is very generally cultivated in Europe as well as in America; and as a native shrub it is found more or less across the continent from Quebec to Washington, and very locally south in the mountains to Virginia.

A second plant often smaller than the glabrous-leaved shrub, though sometimes quite as large, has the leaves pilose or tomentulose beneath, and usually few flowers. This shrub with pubescent leaves is locally abundant, especially on calcareous rocky banks, from east-

ern Quebec and Rupert Land throughout the forested region to Alaska, and south to western New England, northern Pennsylvania, Michigan, Montana, Idaho and California.

The third shrub has the small leaves pilose beneath, but, unlike those of the other two, decidedly whitened below, the leaves of the two preceding shrubs being merely pale green but not white beneath. This shrub with the leaves white beneath is known from Lake Superior to Lake Winnipeg, and from Alberta to Oregon and Colorado.

In the summer of 1904 the first-mentioned shrub, with glabrous leaves, was found in abundance on a wooded bank at Tadousac in eastern Quebec; while on the opposite bank of the River St. Lawrence, at Bic, the second shrub, with the green leaves pubescent beneath, was abundant. The flowers and other features showed no clear differences, but in the pubescent leaves the Bic shrub was strikingly unlike the smooth-leaved shrub of Tadousac. An attempt to identify the two shrubs has brought to light a singular confusion which has long prevailed in our interpretation of the plants which have passed as *Symphoricarpos racemosus.*

The species was described by Michaux from Lake Mistassini, but in his original description there is nothing to indicate whether or not the leaves are pubescent or glabrous. A pencil-note, however, "leaves very tomentulose beneath," which I made in 1903 while examining the herbarium of Michaux at the Muséum d'Histoire Naturelle in Paris, indicates that the Michaux type from Lake Mistassini was the pubescent leaved shrub which we know to be generally distributed in western Quebec and western New England, and which has usually passed as *Symphoricarpos racemosus*, var. *pauciflorus.*

The widespread application of the name *Symphoricarpos racemosus* to the glabrous-leaved shrub seems to be due to an erroneous identification of Loddiges in 1818. In the text accompanying the first illustration of this glabrous-leaved shrub (as *Symphoria racemosa*), Loddiges said: "This plant is quite new to this country [England]; we received it, for the first time, last spring, from our friend Mr. Robert Carr, who informs us that it is a native of the Western country of North America, and was found by Lewis and Clark beyond the rocky mountains, in August 1805: we consider it, however, to be the Symphoria racemosa of Michaux."[1] Loddiges' identification was accepted by Sims, in 1821, in the Botanical Magazine, where a col-

[1] Lodd., Bot. Cab. iii. no. 230 (1818).

ored illustration of the plant was presented;[1] and under the name *Symphoricarpos racemosus* the shrub soon became common in cultivation, and no one seems to have noticed that it was unlike the Canadian type preserved in the Michaux herbarium.

Robbins's *Symphoricarpos racemosus*, var. *pauciflorus*, as originally published in the fifth edition of Gray's Manual, in 1867, was distinguished by having reduced inflorescences and it came from "Rocky woods of L. Superior, *Dr. Robbins*, and northwestward. Alleghanies of Pennsylvania, *J. R. Lowrie, Mr. Bocking*." No mention, however, was made of the remarkable whitening of the under leaf-surfaces which is conspicuous in all Robbins's Lake Superior material and that from "northwestward" (*i. e.*, Lake Winnipeg Valley, *Bourgeau*). The leaves of the Pennsylvania material, from Blair and Huntington Counties, originally associated with the Lake Superior plant, are merely pale green but not white beneath and are like those of the pubescent-leaved plant of western New England and Quebec which is now identified with the Michaux type of *S. racemosus*.

The attempt to separate as a variety or a species the plants with reduced inflorescences is apparently artificial. At Bic, where the pubescent-leaved plant which has generally passed in the East as *Symphoricarpos racemosus*, var. *pauciflorus* (but which is really the true *S. racemosus*) abounds, shrubs on the same slope have the flowers solitary or in twos, or often several in an interrupted raceme. Again, the glabrous-leaved plant which has erroneously passed as true *S. racemosus* may often quite lack the elongate terminal raceme which is supposed to characterize it. Without characters other than those found in the presence or absence of pubescence on the leaves, the three plants occurring in eastern America are best treated as varieties of a broadly distributed species.

Symphoricarpos racemosus, Michx. Shrub 0.2 to 1 m. high: leaves from elliptic-oblong to orbicular, *pilose beneath*.— Fl. Bor.-Am. i. 107 (1803). Var. *pauciflorus*, Robbins in Gray, Man. ed. 5, 203 (1867), as to Pennsylvania plant; and most authors of New England, New York, and Pennsylvania. *S. pauciflorus*, Britton, Mem. Torr. Cl. v. 305 (1894), in part.— Rupert Land to Alaska, south to Berkshire County, Massachusetts, Huntingdon and Blair Counties, Pennsylvania, Michigan, Montana, Idaho, and California.— Much of the

[1] Sims, Bot. Mag. xlviii. t. 2211 (1821).

northwestern material which is passing as *S. mollis*, Nutt., seems inseparable from *S. racemosa*.

Var. **laevigatus**. Often taller: *leaves glabrous beneath*. — *Symphoria racemosa*, Loddiges, Bot. Cab. iii. no. 230 (1818); Sims, Bot. Mag. xlviii. t. 2211 (1821). *Symphoricarpos racemosus*, most authors, not Michaux. — Saguenay County, Quebec to Washington, locally south in the mountains to Virginia. Freely cultivated and commonly escaped to roadsides, etc.

Var. PAUCIFLORUS, Robbins. Dwarf shrub: leaves more or less pubescent and *strongly whitened beneath*.— Robbins in Gray, Man. ed. 5, 203 (1867), as to Lake Superior and Winnipeg ("northwestward") plant. *S. pauciflorus*, Britton, Mem. Torr. Cl. v. 305 (1894), in part.— Lake Superior to Lake Winnipeg, and locally in the mountains from Alberta to Oregon and Colorado.

GRAY HERBARIUM.

THE ONTARIO NATURAL SCIENCE BULLETIN is the journal of the Wellington Field Naturalist's Club, the first number of which was issued at Guelph, Ontario, April 15th. The Bulletin is edited by A. B. Klugh, a guarantee that its future numbers will follow the first in containing many items of interest to the northeastern botanist.

LOTUS TENUIS AS A WAIF IN RHODE ISLAND.— On July 3, 1905, in a wet meadow near the railroad track as it enters Newport, Rhode Island, I found a small colony of *Lotus tenuis*, Waldst. & Kit. The meadow is quite on the outskirts of the town, with no gardens near at hand from which the plant could have escaped. The species is a native of Europe and was in full bloom. There were two patches, one growing in the meadow and the other by a cartroad, some twenty-five feet away. On July 25th I found a single plant of the same kind in the next meadow, across the road and to the northeast of the others, where possibly a seed had been carried by the prevailing southwest summer wind. By August 3rd no more flowers were to be found, but the plants were covered with pods. Specimens of this interesting plant have been deposited in the herbaria of Mr. Walter Deane, Mrs. George S. Parker, and the writer. It may be worth while to record also the finding of *Lycium vulgare*, Dunal, the Matri-

mony Vine, in Newtown, Rhode Island, growing along a wall in a dry pasture far from any apparent cultivation.— Reginald Heber Howe, Jr., Concord, Massachusetts.

PHYCOLOGICAL NOTES OF THE LATE ISAAC HOLDEN,— I.

Edited by F. S. Collins.

In the notice of Mr. Isaac Holden, Rhodora, Vol. V, p. 219, mention was made of the careful record it was his custom to make of his collecting, with a view of publication as soon as a sufficiently complete list of the flora of the region near Bridgeport, Connecticut, could be made. At the time of his death nothing had been done towards publication, but now by the courtesy of Mr. Holden's family, his note books have been entrusted to the writer, who hopes to be able to make their contents available to the readers of Rhodora. Mr. Holden's numbered notes begin in 1890; the first 11 numbers referring to forms of the genus *Batrachospermum*, to which he was then giving special attention; each number covering specimens of a particular type or station, but of various dates; with No. 12 begins the system, afterwards followed, of using a number only for one date and for one form, but including an indefinite number of specimens of any one date and place, supposed to be identical. No. 12, the first under this plan, is *Cladophora Rudolphiana* Ag., May 18, 1890; the last is No. 1553, *Laminaria Agardhii* Kjellman, May 10, 1903, about six weeks before Mr. Holden's death. While absolute dependence can be placed in all of these records, no deduction should be drawn from the absence or the infrequence of record of any species; the record is one of specimens collected, not of plants observed; common forms, in regard to which no question was likely to occur, were passed by without record; for a fuller list of the marine algae of the Bridgeport region see Lists of New England Plants, V, Marine Algae, Rhodora, Vol. II, p. 41; the Connecticut column rests almost entirely on Mr. Holden's collections, and includes everything found by him up to the publication of the list; as regards fresh water algae, however, the present paper includes practically all Mr. Holden's observations.

For several years before 1890 Mr. Holden had collected marine algae, but his specimens were not numbered; some species, such as the delicate form of Rhodomela, *R. Rochei* Harvey, found abundantly then at Seaside Park, have not been seen, or are very rare, recently; the changes incident to the rapid growth of a city are felt by seaweeds as well as in other directions; some of the stations here given are no longer available; at Cook's Point, for instance, the original stations of *Stictyosiphon subsimplex* Holden, and *Hydrocoleum Holdenii* Tilden, have been destroyed by the building of great factories and the cutting of channels and ditches through the marshes; but marshes of similar character are abundant in the vicinity, and other stations will undoubtedly be found.

Mr. Holden distributed specimens freely to his correspondents, and in most cases these specimens bore the numbers from his note book; changes in names have been made in the past few years in some cases, and in the present list the latest accepted form is used. In the main it agrees with the list in RHODORA, Vol. II, p. 41, and where it differs, the name used in the latter is given as a synonym. Where the name on a numbered specimen is found to differ from the name under the same number in this list, the latter can be accepted as representing either a change required by later botanical developments, or a more mature determination by Mr. Holden. Few collectors were as careful as he to secure specimens at once in perfect condition for study, and representing at their best the form and color of the living plant; he never could refrain from collecting and mounting fine specimens of such genera as *Grinnellia*, *Dasya*, *Antithamnion*, which probably occur nowhere in the world in greater perfection and luxuriance than in Long Island Sound; the long series of numbers under each of these will show what favorites they were; but at the same time the most insignificant and unattractive appearing plants were collected and studied, time after time, until their identity was ascertained, and usually a set secured for distribution. Practically all of Mr. Holden's spare time for the thirteen years covered by this list was given to this work; but the great business enterprise of which he had charge took even more of his time than most men give to business. The dates in the note book might almost serve as a calendar of the Sundays and legal holidays for the thirteen years, with an occasional Saturday afternoon added. Mr. Holden was delightful in social relations; but an invitation to anything of a social nature

at an hour of daylight when he was free from business he would decline, with his regrets that he could not accept, as "the tide did not come just right for it that day," and he would start again for his favorite shore or stream.

In the present publication the record will not be in chronological order, but by species; the marine and fresh water forms from Connecticut localities being in separate lists. Under each species (or variety) will be given the numbers, the localities and the dates; and where specimens of the number in question were distributed in the Phycotheca Boreali-Americana, this will be indicated by the initials P. B.-A., with number. Notes made by Mr. Holden on special points of habit, structure, etc., will be given in quotation marks. After the Connecticut lists a short list will be given, representing collections made in Newfoundland, in July, 1897. Collections made during short visits to Mount Desert, Maine, Wood's Hole, Massachusetts, etc., have been already utilized in other publications. Published lists of algae are too often restricted to mere names; where a locality is given it is often only a town name; and any indication of time of occurrence is rather exceptional. The more recent European works give fuller details in these matters, as well as in regard to the environment favorable to a particular species; but in American publications little of this is to be found; a beginning, at least, can be made in this case. The month will always be given, but not the year; where there are notes as to fruit, the month for that will also be indicated, and the locality will be given with the utmost exactness possible. That so few exact localities are on record for algae seems strange, as there are no plants for which exact details are so desirable; a flowering plant in bloom is a conspicuous object, easily noted as one walks or even rides along; ferns are much the same, and even small Botrychiums can be found by getting down on one's knees; the larger fungi stand out plainly, the micro-fungi are associated with definite hosts; but with algae, especially with fresh water algae, the case is different. The stream in which they grow may be invisible to one walking a few rods away; in the pond there may be many species, sometimes mingled, sometimes in zones of depth, sometimes one at one point, another at another; often a species is persistent year after year in a very limited locality, and not elsewhere. The flowering plant or the fern is at once recognizable, or at most the question is between two or three critical species; but it is different with fresh

water algae. In the eastern states there are over 30 species of *Spirogyra*, over 50 species of *Oedogonium*; not one of these can be recognized at sight, or even by inspection with a pocket lens; it would be barely possible sometimes to distinguish the genus by the lens, and often not even this; if looking for a certain species of *Oedogonium*, recorded from a certain town, perhaps known only from that one station, one might spend days wandering about, collecting every green thing, examining each in the evening with the microscope, and finally go away without the desired plant. Details as to station that would be unnecessary with flowering plants, that would even seem grotesque to botanists generally, may be very useful. It might excite mirth to read that *Oedogonium Ravenellii* grew in South Springfield, in the pond in Smith's pasture, at the place where Jones's cattle come down to drink; and yet, without some such detail, one might spend a day in vain in looking for the rare species. Of course the cows may change their habits, as everything in this world changes; but cows and country residents generally are conservative, and changes in such matters are infrequent. As regards the larger marine algae, such full detail is not as necessary, but it is a help, and the smaller forms require it only in a less degree than the fresh water forms; nearly every species thrives best in some particular environment; shallow bay, swift current, exposed to surf, etc.; the knowledge of this is convenient to the collector. For the interest of the student who wishes to learn in regard to such preferences of environment, but who cannot visit the station, indications of the characters of the principal localities here referred to will perhaps be useful. Seaside Park, Pleasure Beach, Long Beach, and Woodmont, are sandy or pebbly shores open to Long Island Sound; often with boulders of various sizes, but at Woodmont is the only exposure of solid rock for many miles; several species not recorded elsewhere in the Sound are found here. The Gut is a narrow channel, through which the tide runs swiftly; Cook's Point is low and marshy, facing Bridgeport harbor; Stratford Shoals (or Middle Ground), Penfield Reef, and Black Rock, are points in the Sound, marked by lighthouses or beacons, and nearly or quite covered at high tide. Fresh Pond is in Stratford, and is connected with the Sound by a narrow channel, which at times is open, at times closed by gates; the water varies from slightly brackish to fully as salt as the sea; but in spite of the name, is never fresh. Yellow Mill Pond is a shallow muddy bay, the bottom bare at low tide, the outlet crossed by Yellow Mill

Bridge, under which the tide runs in and out swiftly. The fresh water stations require no comment, as the name usually gives sufficient indication.

Connecticut Marine Algae.

Polycystis elabens (Kütz.) Farlow. 870, with *Anabaena variabilis*, on decaying algae, Fresh Pond. Aug.

Gloeocapsa crepidinum Thuret. 152, 596, 939. Stratford Shoals, on stonework; on wharf logs. May, Sept.

Entophysalis granulosa Kütz. 707, 749, 1132 = P. B.–A. 152b. On stones in Fresh Pond. Aug.–Oct.

Pleurocapsa fuliginosa Hauck. 766, 770, 773, 778, 897, 898, 904 = P. B.–A. 101, 905, 906, 907, 908, 939, 968. On *Enteromorpha* and stones between tides, below Yellow Mill Bridge. Nov., Dec., May, Aug.

Xenococcus Schousboei Thuret. 607, 622, 667, 768. On *Chantransia virgatula*, *Sphacelaria radicans*, *Rhodochorton Rothii*; Seaside Park; Black Rock; Fresh Pond. June, July, Dec.

Hyella caespitosa Born. & Flah. 861, 1513. In shells. June, Aug.

Spirulina subsalsa Oersted. 334, 626, 1133, 1320 = P. B.–A. 252. On algae and *Ruppia*, Fresh Pond. May, July, Aug. July 7, "In large expanded masses on stalks of *Ruppia*. Could take it up in jelly-like masses half an inch thick, pure *Spirulina*."

Oscillatoria chalybea Mert. 890, 940, 941, 948. Outlet of Fresh Pond; on woodwork, rocks, and *Enteromorpha*, below Yellow Mill Bridge. May, June, Nov.

O. Corallinae (Kütz.) Gomont. 711, 1039. On *Gelidium*, Woodmont; on *Enteromorpha* below Yellow Mill Bridge. Sept.

O. formosa Bory. 1503 = P. B.–A. 710. Floating on stagnant marsh pools, near Fresh Pond. May.

O. laetevirens Crouan. 1471. Forming a film on old grassy bottom, brackish marsh pool, Cook's Point. June.

Lyngbya aestuarii (Mert.) Liebm. 60, 168, 341, 344, 440, 1466. Cook's Point, Fresh Pond. June, July, Sept. Oct.

L. confervoides Ag. 152, 486, 1040, 1529. Stratford Shoals, on stone and iron work. July, Sept., Oct.

(*To be continued.*)

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ECLIPTA ALBA IN MASSACHUSETTS.

S. N. F. Sanford.

The appearance of any plant in a new locality is always interesting, whether the extension of its range has been gradual, or is the result of accident, the plant becoming established in the latter case by quick adaptation to its new surroundings.

The discovery of *Eclipta alba* Hassk. at Fall River, Massachusetts, Sept. 5, 1905, led to the usual inquiry regarding the present knowledge of the plant in the North, for the manuals give the range as Southern New York, New Jersey, and Southward to Florida. A specimen collected on the South Boston flats by C. E. Perkins, in 1879, is in the herbarium of the New England Botanical Club, and this appears to be the basis of the only other New England record. The South Boston station is now probably destroyed.

The Fall River specimens are not mere waifs struggling to exist, for the writer counted some fifty vigorous, nearly full-sized plants growing on both sides of a stream, some of them bearing five or more stout branches, each with one to several flowers. The limited area in which the plants were found, however, points to a very local origin, and the proximity to the terminus of a railroad over which is transported much cotton from the South, indicates at once their probable source.

Aside from the discovery of *Eclipta alba* so far out of its natural range, an interesting study of habitat is involved. The land is low, wet, waste ground through which runs a small stream of fresh water. Into this stream is a more or less constant flow of hot water from a neighboring cotton mill, resulting in a warm, moist atmosphere all

about the area. This combination has produced an ideal habitat for *Eclipta*, the conditions being not unlike those which prevail in its Southern home. Add to this the fact that the plant is a composite with the usual vitality of that group, and there is no reason why the plants should not continue to thrive and spread.

Fall River, Massachusetts.

RECENTLY RECOGNIZED SPECIES OF CRATAEGUS IN EASTERN CANADA AND NEW ENGLAND, — VI.

C. S. Sargent.

(*Continued from page 164.*)

Stamens 10 or less.
Mature leaves thin.
Anthers pink.

Crataegus rhombifolia, Sargent, Rhodora, v. 193. (1903.)

This species, described from specimens gathered by Dr. C. B. Graves near Norwich, Connecticut, appears to be widely distributed through western New England and to cross the Hudson River into eastern New York. Massachusetts, Great Barrington, *Brainerd* and *Sargent*; Vermont, Ferrisburg, *Brainerd*; Twin Mountain, Rutland, *Eggleston* (nos. 2229 and 2343), and Gardener's Island (nos. 2320 and 2343), Charlotte, *Horsford* in 1879: New York, *Peck*, North Greenbush (no. 69), Whitehall (no. 61), Crown Point, *Eggleston* (nos. 2236 and 2264), *Brainerd* and *Sargent* in 1900.

Crataegus Peckietta, n. sp. Leaves oblong-obovate to oval or broad-rhombic, short-pointed and acuminate at the apex, gradually narrowed and concave-cuneate at the entire base, sharply doubly serrate above, with straight glandular teeth and usually slightly and irregularly divided above the middle into small acute lobes, nearly fully grown when the flowers open during the first week of June and then thin, yellow-green, lustrous and scabrate above, with short white hairs and pale and glabrous below with the exception of a few short hairs along the base of the veins, and at maturity thin but firm in texture, glabrous, yellow-green, smooth and lustrous on the upper and pale on the lower surface, 5–6 cm. long and 3–4 cm. wide, with

thick yellow midribs and 5 or 6 pairs of slender primary veins extending obliquely to the points of the lobes; petioles stout, narrowly wing-margined to the middle, puberulous while young, deeply grooved on the upper side, 1–2 cm. long; leaves on vigorous shoots oblong-obovate, more coarsely serrate, slightly lobed, often 8–9 cm. long and 5–6 cm. wide, with stout petioles about 3 cm. in length. Flowers 1.2–1.4 cm. in diameter, on long slender glabrous pedicels, in loose lax 15–20-flowered compound corymbs; calyx-tube narrowly obconic, glabrous, the lobes wide, acuminate, glandular-serrate, villose on the outer and covered on the inner surface with matted pale hairs, reflexed after anthesis; stamens 9–11, usually 10; anthers pale pink; styles 1–3. Fruit ripening from the first to the middle of September and remaining on the branches until after the leaves have fallen, on long drooping pedicels, in many-fruited clusters, ovate, rounded at the apex, nearly truncate at the base, red or greenish red, 9–10 mm. long and wide; calyx little enlarged, with a deep narrow cavity, and closely appressed lobes red below the middle and villose on the upper side, and often deciduous from the ripe fruit; flesh thin, dry and yellow; nutlets 2 or 3, full and rounded at the base, gradually narrowed and rounded at the apex, rounded and ridged on the back, with a low broad ridge, penetrated on the inner faces by long narrow cavities, about 6 mm. long and 4 mm. wide.

A shrub 2–5 m. high, with numerous stems 5–7 cm. in diameter near the ground and covered with gray-brown bark, the lower branches horizontally spreading, the upper ascending, and slender slightly zigzag branchlets marked by occasional oblong pale lenticels, dark orange-green and glabrous when they first appear, becoming bright chestnut-brown and very lustrous in their first season and dull gray-brown the following year, and armed with slender slightly curved red-brown shining spines 6–8 cm. long.

Rocky ridges; central, eastern and southern Adirondack region, New York, *Charles H. Peck*, Piseco, (no. 63 type), June, August and September, 1904, also Lake Pleasant, Hamilton County, Keene, Essex County, June, 1905, and Horicon, Warren County.

Crataegus Bristolensis, n. sp. Leaves ovate to rhombic, acute or acuminate, gradually narrowed and concave-cuneate at the entire base, finely doubly serrate above, with straight glandular teeth, and divided into 4 or 5 pairs of small acuminate lateral lobes, nearly half grown when the flowers open about the middle of May and then membranaceous, light yellow-green and roughened above by short rigid white hairs and glaucous below, and at maturity thin but firm in texture, smooth, yellow-green and lustrous on the upper and paler on the lower surface, 7–8 cm. long, 5–6 cm. wide, with stout midribs and slender primary veins arching obliquely to the points of the lobes;

petioles slender, slightly wing-margined at the apex, grooved on the upper side, glabrous, often dark rose color late in the season, 3–4 cm. in length. Flowers about 1.5 cm. in diameter, on slender elongated glabrous pedicels, in wide lax usually 8–10-flowered corymbs, with linear glandular bracts and bractlets fading rose color and mostly deciduous before the flowers open; calyx-tube narrowly obconic, glabrous, the lobes slender, entire or occasionally glandular-dentate near the middle, tinged with red toward the acuminate apex, glabrous on the outer and puberulous on the inner surface, reflexed after anthesis; stamens 10; anthers pale pink; styles 2 or 3. Fruit ripening the end of September, on slender red pedicels, in few-fruited drooping clusters, oval, bright scarlet, covered with a slight bloom, marked by small pale dots, 1.2–1.4 cm. long; calyx little enlarged, with a narrow deep cavity, and closely appressed lobes pubescent on the upper side, their tips often deciduous from the ripe fruit; flesh thin, greenish yellow; nutlets 2 or 3, full and rounded at the ends, or when 3 narrowed and acute at the apex, ridged on the back, with a broad low deeply grooved ridge, penetrated on the inner faces by broad shallow irregular cavities, about 6 mm. long and 4 mm. wide.

A broad shrub, with stout nearly straight branchlets marked by small oblong pale lenticels, dark orange-green and glabrous when they first appear, becoming bright chestnut-brown and lustrous during their first season, orange-brown and lustrous in their second year, and ultimately light gray tinged with red, and armed with numerous stout straight or slightly curved chestnut-brown shining spines 3–5 cm. long.

Somerset, Bristol County, Massachusetts, *J. G. Jack*, (no. 7 type), May and September 1903.

The relationship of this species is with *Crataegus fertilis*, Sarg., of the Penobscot Valley, Maine (see Rhodora, v. 182), but it differs from that species in its scabrate leaves, smaller at the flowering time, more slender petioles, glabrous pedicels and corymbs, narrow nearly entire and less hairy calyx-lobes, in its less lustrous fruit in fewer-fruited clusters, and in its shorter and more slender spines.

Crataegus baccata, n. sp. Leaves rhombic to oval or rarely obovate, short-pointed and acuminate at the apex, gradually narrowed and concave-cuneate at the entire base, finely often doubly serrate above, with straight glandular teeth, and slightly divided above the middle into 4 or 5 pairs of small acuminate lobes, more than half grown when the flowers open during the first week of May and then membranaceous, light yellow-green, roughened by short white hairs and pubescent or villose along the midribs above and pale and glabrous with the exception of a few axillary hairs below, and at maturity thin but firm in texture, smooth, lustrous, and yellow-

green on the upper and pale on the lower surface, 5–6 cm. long and 3–5 cm. wide, with stout midribs tinged with rose late in the season on the lower side toward the base, and slender yellow primary veins extending obliquely to the points of the lobes; petioles slender, wing-margined at the apex, deeply grooved, sparingly villose while young, rose-colored in the autumn, 8–18 mm. in length. Flowers about 1.5 cm. in diameter, on slender villose pedicels, in wide lax many-flowered hairy corymbs, with linear-obovate to lanceolate glandular bracts and bractlets, fading brown and mostly deciduous before the flowers open; calyx-tube narrowly obconic, glabrous, the lobes slender, acuminate, glandular, with bright red glands, glabrous on the outer and coated on the inner surface with shining white hairs, reflexed after anthesis; stamens 5–10; anthers pink; styles 2 or 3, usually 2. Fruit ripening early in September and soon falling, on slender pedicels, in few-fruited erect or spreading clusters, subglobose, orange-red, lustrous, marked by many small pale dots, 7–8 mm. in diameter; calyx little enlarged, with a narrow shallow cavity, and spreading lobes serrate above the middle, villose on the upper side and usually persistent on the ripe fruit; flesh thin, yellow, dry and mealy; nutlets generally 2, full and rounded at the ends, prominently ridged on the back, with a broad deeply grooved ridge, penetrated on their inner faces by deep narrow irregular cavities, about 6 mm. long and 5 mm. wide.

A shrub 2–3 m. high, with numerous erect spreading stems, and stout zigzag branchlets marked by occasional oblong pale lenticels, light orange-green and glabrous when they first appear, becoming light reddish brown and lustrous and ultimately dull gray-brown, and armed with many straight slender light red-brown shining spines 4–6 cm. in length.

Low rocky pastures, Worcester County, Massachusetts, South Lancaster, *E. F. Thayer*, September, 1903, May, 1904 (type); Fayville, *S. C. Sears*, May 1903.

Anthers pale yellow.

Crataegus Handyae, n. sp. Leaves broadly ovate to rhombic, acute or acuminate, rounded or concave-cuneate at the entire base, coarsely doubly serrate above, with straight glandular teeth, and divided above the middle into 4 or 5 pairs of broad acuminate lobes, more than half grown when the flowers open about the 20th of May and then membranaceous, yellow-green, very smooth and glabrous above, with the exception of a few hairs on the midribs, and glaucous and villose on the sides of the slender yellow midribs and veins below, with short white hairs persistent during the season, and at maturity thin but firm in texture, dark green, glabrous and lustrous on the upper and pale on the lower surface, 6–7 cm. long and 4–6 cm. wide; petioles slender, slightly wing margined at the apex, deeply grooved

on the upper side, glabrous, 3–4 cm. in length. Flowers 1.8–2 cm. in diameter, on slender elongated glabrous pedicels, in broad lax usually 6–10-flowered corymbs, with linear obovate to lanceolate minutely glandular bracts and bractlets, fading rose color and mostly deciduous before the flowers open; calyx-tube narrowly obconic, glabrous, the lobes gradually narrowed from wide bases, acuminate, glandular-serrate usually only near the middle, glabrous on the outer, puberulous on the inner surface, reflexed after anthesis; stamens 10; anthers creamy white; styles 2 or 3, surrounded at the base by a ring of long white hairs. Fruit ripening at the end of September, on long slender drooping pedicels, in few-fruited clusters, subglobose, bright scarlet, lustrous, marked by occasional large pale dots, 1–1.2 cm. in diameter; calyx little enlarged, with a deep narrow cavity, and spreading reflexed or incurved lobes villose-pubescent above and dark red toward the base on the upper side; flesh thin, light yellow, slightly acid; nutlets 2 or 3, narrowed and rounded at the ends or when 3 acute at the apex, prominently ridged on the back, with a broad high deeply grooved ridge, penetrated on the inner faces by broad shallow irregular cavities, 7–8 mm. long, 4–5 mm. wide.

A shrub, with stout zigzag branchlets marked by numerous small oblong pale lenticels, light orange-green and glabrous when they first appear, bright chestnut-brown and very lustrous during their first season and ultimately dark gray-brown, and armed with slender slightly curved purplish spines 4–6 cm. long.

Somerset, Bristol County, Massachusetts, *J. G. Jack* (no. 8 type), May and September, 1903.

This distinct and handsome species is named for Miss Louise Holmes Handy of Fall River who first called my attention to the presence of several species of Crataegus in Fall River and Somerset.

Crataegus Stratfordensis, n. sp. Leaves oval to obovate, acuminate, gradually narrowed and concave-cuneate or, on vigorous shoots, rounded at the entire base, finely doubly serrate above, with straight glandular teeth and slightly divided above the middle into 4 or 5 pairs of short acuminate lobes, more than half grown when the flowers open during the first week of June and then thin, pale yellow-green and puberulous on the midribs above and pale and sparingly villose below along the midribs and veins, with short white persistent hairs, and at maturity thin but firm in texture, yellow-green and glabrous on the upper and paler yellow-green on the lower surface, 6–9 cm. long and 4.5–5 cm. wide, with slender light yellow midribs and 6–8 pairs of thin primary veins; petioles slender, wing-margined to the middle, deeply grooved on the upper side, 1–2 cm. long. Flowers about 1.5 in diameter, on slender elongated sparingly villose pedicels, in broad lax many-flowered corymbs, with linear obovate to lanceolate rose-colored bracts and bractlets mostly deciduous before the flowers

open; calyx-tube narrowly obconic, glabrous, the lobes wide, laciniately glandular-serrate, with bright red glands, glabrous on the outer, puberulous on the inner surface; stamens 7–10; anthers pale yellow or greenish white; styles 2 or 3, surrounded at the base by a narrow ring of pale hairs. Fruit ripening at the end of September, on long slender pedicels, in many-fruited drooping clusters, oval, greenish yellow mottled with crimson, lustrous, 8–10 mm. long and 7–8 mm. wide; calyx prominent, with a short tube, a broad deep cavity, and reflexed coarsely serrate lobes, their tips mostly deciduous from the ripe fruit; flesh thin and dry; nutlets 2 or 3, full and rounded at the base and gradually narrowed and rounded at the apex, rounded and only slightly ridged on the back, penetrated on the inner faces by large deep cavities, about 7 mm. long and 5 mm. wide.

A broad shrub 3–4 m. high, with numerous stems and stout nearly straight branchlets, dark orange-yellow and glabrous when they first appear, light chestnut-brown and lustrous during their first winter and dull brown tinged with red the following year, and armed with many stout straight or slightly curved purplish ultimately shining spines 4–6 cm. long.

Dry banks of pond holes near the coast of Long Island Sound, Stratford, Fairfield County, Connecticut, *E. H. Eames* (no. 137 type), May, June and September, 1901.

Crataegus pellucidula, n. sp. Leaves oval to obovate-oblong, acute, gradually narrowed to the concave-cuneate entire base, finely doubly serrate above, with straight or incurved glandular teeth, and slightly divided into short acute lateral lobes, more than half grown when the flowers open about the 1st of June and then membranaceous, light yellow-green, slightly roughened by short white hairs and villose along the midribs above and pale and glabrous below with the exception of a few short hairs along the primary veins and in their axes, and at maturity thin but firm in texture, glabrous, yellow-green, smooth and lustrous on the upper and pale on the lower surface, 6–7 cm. long and 4–5 cm. wide, with stout yellow midribs often tinged with rose color toward the base, and thin primary veins extending obliquely to the points of the lobes; petioles slender, wing-margined at the apex, deeply grooved and puberulous while young on the upper side, soon glabrous, 1–1.5 cm. in length. Flowers on stout elongated villose pedicels, in lax many-flowered compound villose corymbs, with linear obovate glandular bracts and bractlets, fading brown and mostly deciduous before the flowers open; calyx-tube broadly obconic, covered at the base with matted pale hairs, nearly glabrous above, the lobes wide, foliaceous, acuminate, laciniately glandular-serrate; stamens 10; anthers cream color; styles 2 or 3. Fruit ripening the end of September, on drooping slender reddish pedicels, in flat many-fruited clusters, subglobose, scarlet, very lus-

trous, translucent, marked by occasional large pale dots, 1.2–1.4 cm. in diameter; calyx enlarged, with a broad deep cavity, and large coarsely serrate erect or incurved lobes usually persistent on the ripe fruit; flesh thick, succulent, orange color; nutlets 2 or 3 rounded at the ends, rounded and ridged on the back, with a broad low slightly grooved ridge, irregularly penetrated on the inner faces by large deep cavities, dark-colored, about 7 cm. long and 4 cm. wide.

A tree 3–4 m. high, with a trunk 8–10 cm. in diameter, and stout nearly straight branchlets marked by large pale oblong lenticels, light yellow-green when they first appear, bright red-brown and lustrous during their first winter, and dull gray faintly tinged with red the following year, and armed with stout straight or slightly curved purplish lustrous ultimately gray-brown spines 4–5 cm. long.

Rocky pastures, Litchfield, Litchfield County, Connnecticut, *C. H. Bissell* (no. 72 type), September 1903, May 1904.

Well distinguished by the very broad laciniate calyx-lobes enlarged and erect on the beautiful dark lustrous fruit.

Crataegus spatiosa, n. sp. Leaves ovate, acute or acuminate, rounded or abruptly concave at the broad entire often unsymmetrical base, sharply doubly serrate above, with straight glandular teeth, and divided into 5 or 6 pairs of short broad acuminate lateral lobes, more than half grown when the flowers open during the last week of May and then thin, dark green, shining and slightly roughened above by short whitish hairs and paler and sparingly villose below along the midribs and veins, with short hairs mostly persistent throughout the season, and at maturity thin but firm to subcoriaceous, smooth, dark green and lustrous on the upper and pale yellow-green or whitish on the lower surface, 6–8 cm. long, 5.5–7 cm. wide; petioles stout, narrowly wing-margined at the apex, glabrous, glandular, with small stipitate red persistent glands, 2.5–3 cm. in length; stipules linear, glandular-serrate, fading rose color, caducous; leaves on vigorous shoots broadly ovate, gradually narrowed and concave-cuneate at the base, more coarsely serrate, often deeply divided into broad acuminate lobes, 7–8 cm. long and 6–7 cm. wide. Flowers cup-shaped, 2–2.3 cm. in diameter, on short slender glabrous pedicels, in compact usually 5–9-flowered corymbs, with linear-lanceolate bracts and bractlets, fading brown and generally deciduous before the flowers open; calyx-tube narrowly obconic, glabrous, the lobes slender, acuminate, obscurely glandular mostly near the middle, reflexed after anthesis; stamens 10; anthers pale cream-color; styles 3, or rarely 4, surrounded at the base by a narrow ring of pale tomentum. Fruit ripening early in October, on slender erect pedicels, in few-fruited clusters, oval to globose or rarely depressed globose, concave at the base, scarlet, lustrous, often blotched with yellow, marked by occa-

sional minute pale dots, 1.2–1.3, or rarely 1.4 cm. in diameter, and when oval once and a half as long as broad; calyx prominent, with a narrow deep cavity and appressed lobes often deciduous from the ripe fruit; flesh thin, light orange color, insipid; nutlets usually 3, rounded at the base, gradually narrowed and rounded at the apex, ridged on the back, with a broad deeply grooved ridge, penetrated on the inner faces by large shallow cavities, about 7 mm. long and 4 mm. wide.

A slender tree sometimes 7 m. high, with a trunk occasionally 10 cm. in diameter, covered with rough gray bark, small spreading and recurved branches, and slender slightly zigzag branchlets marked by oblong pale lenticels, light yellow-green and glabrous when they first appear, light reddish or orange-brown and lustrous during their first season and gray-brown the following year, and armed with slender nearly straight chestnut-brown shining ultimately ashy gray spines 4–6 cm. long; or often a tall shrub with numerous ascending stems.

Oak woods; shore of Fishers Island Sound, Mumford's Point, Groton, New London County, Connecticut, *C. B. Graves* (no. 60 a type), May, September and October 1903.

Crataegus Emersoniana, n. sp. Leaves broadly ovate to oval, short-pointed and acuminate at the apex, rounded or cuneate at the entire base, sharply doubly serrate above, with straight or incurved glandular teeth, and divided above the middle into 3 or 4 pairs of short acuminate spreading lobes, nearly half-grown when the flowers open about the 20th of May and then thin, light yellow-green, smooth and glabrous above with the exception of a few soft hairs near the base of the midribs and pale and sparingly villose below along the primary veins and in their axils, with short persistent hairs, and at maturity thin but firm, dark yellow and lustrous on the upper and paler on the lower surface, 5–6 cm. long and broad, with slender petioles wing-margined at the apex, slightly grooved, sparingly villose along the upper side while young, soon glabrous, occasionally glandular, with minute dark deciduous glands, rose-colored in the autumn, 2–2.5 cm. in length; leaves on vigorous shoots usually rounded at the base, more deeply lobed, 8–10 cm. long and broad, with stout broadly winged petioles glandular through the season. Flowers about 2 cm. in diameter, on long slender glabrous pedicels, in 7–15-flowered compound corymbs; calyx-tube narrowly obconic, glabrous, the lobes slender, acuminate and red at the apex, slightly dentate above the middle, glabrous on the outer, sparingly villose on the inner surface, reflexed after anthesis; stamens 10; anthers pale yellow; styles 3–5, surrounded at the base by a narrow ring of scattered white hairs. Fruit ripening at the end of September, on slen-

der drooping red pedicels, in few-fruited clusters, subglobose to globose, scarlet, lustrous, marked by numerous small pale dots, 1.2–1.4 cm. in diameter; calyx little enlarged, with a broad shallow cavity, and reflexed and closely appressed slightly serrate lobes dark red below the middle and puberulous on the upper side, their tips often deciduous from the ripe fruit; flesh thick, dry and mealy; nutlets 3 or 4, rounded at the base, gradually narrowed and rounded at the apex, ridged on the back, with a broad high deeply grooved ridge, penetrated on the inner faces by long and narrow shallow cavities, about 7 mm. long and 4–5 mm. wide.

A shrub 1–2 m. high, with stout zigzag branchlets marked by numerous oblong pale lenticels, orange-yellow and glabrous when they first appear, becoming light chestnut-brown and lustrous in their first winter and dull gray-brown the following year, and armed with numerous slender slightly curved purplish shining spines 5–6 cm. long.

Somerset, Bristol County, Massachusetts, *J. G. Jack* (no. 4 type), May and September 1904.

This species, and *C. spatiosa*, resemble the Coccineae in the character of the leaves and in the general appearance of the fruit, but the cavities on the ventral surfaces of the nutlets, although less developed than in most species of Tomentosae, indicate that they should be referred to that group. It is named in memory of George Barrel Emerson (1797–1881), the author of the classical *Report on the Trees and Shrubs of Massachusetts*, whose love of trees and their cultivation led to the establishment of the Arnold Arboretum.

Mature leaves subcoriaceous to coriaceous.

Anthers rose-color.

Crataegus fulgens, n. sp. Leaves broadly ovate to suborbicular, rounded or acute at the apex, abruptly narrowed and concave-cuneate at the entire base, coarsely doubly serrate above, with straight glandular teeth and slightly divided above the middle into 4 or 5 pairs of small acute lobes, scabrate above while young, with short white hairs, and pale and glabrous below with the exception of occasional axillary persistent hairs, and at maturity coriaceous, dark yellow-green, smooth and lustrous on the upper and pale on the lower surface, 5–7 cm. long and 4–7 cm. wide, with midribs deeply impressed on the upper side of the leaves and rose-colored on the lower toward the base, and prominent yellow primary veins extending obliquely to the points of the lobes; petioles stout, wing-margined at the apex, deeply grooved, dark rose color late in the season, 2–2.5

cm. in length. Flowers opening the first of June, on slender elongated glabrous or sparingly villose pedicels, in usually 10–12-flowered glabrous corymbs, with linear glandular bracts and bractlets fading brown; calyx-tube narrowly obconic, glabrous, the lobes slender, acuminate, laciniately glandular-serrate, glabrous on the outer, puperulous on the inner surface; stamens 5–10; anthers rose color; styles 2 or 3. Fruit ripening the middle of September, on slender red pedicels. in generally 8–10-fruited drooping clusters, subglobose but rather broader than long, crimson, lustrous, marked by numerous small pale dots, 1–1.2 cm. in diameter; calyx little enlarged, with a wide shallow cavity, and spreading closely appressed laciniate lobes villose-pubescent on the upper side and often deciduous from the ripe fruit; flesh thin, orange color, soft and succulent; nutlets 2 or 3, full and rounded at the ends, rounded and usually only slightly ridged on the back, penetrated on the inner faces by short broad cavities, about 7 cm. long and 5 cm. wide.

A broad shrub 3–4 m. high, with stout spreading stems and thick nearly straight branchlets marked by numerous small pale lenticels, light orange-green and glabrous when they first appear, bright chestnut-brown and very lustrous during their first winter and ultimately dark dull gray-brown, and armed with stout nearly straight purplish spines 4–6 cm. in length.

Banks of small ravines, near the coast; Stratford, Fairfield County, Connecticut, *E. H. Eames* (no. 5 type) May 1898, September 1903.

Anthers pale yellow.

Crataegus Searsi, n. sp. Leaves obovate to ovate, acute or acuminate gradually narrowed and cuneate at the entire base, sharply often doubly serrate above, with straight glandular teeth, and divided above the middle into 4 or 5 pairs of short acuminate spreading lobes, deeply tinged with red and coated above with long soft white hairs when they unfold, and nearly half grown when the flowers open during the last week of May and then membranaceous, dark yellow-green, lustrous and roughened above by short rigid white hairs and pale and glabrous below, with the exception of a few hairs on the midribs and in the axils of the primary veins, and at maturity subcoriaceous, yellow-green, smooth and lustrous on the upper and pale yellow-green, and nearly glabrous on the lower surface, 5–6 cm. long and 4–5 cm. wide, with slender midribs often tinged with rose on the lower side toward the base and thin primary veins extending very obliquely to the points of the lobes; petioles slender, wing-margined at the apex, villose on the upper side while young, becoming glabrous 1–1.5 cm. in length; stipules linear, glandular-serrate, bright red, caducous; leaves on vigorous shoots broadly ovate to rhombic, sometimes

rounded at the gradually narrowed base, more coarsely serrate and more deeply lobed, and often 5–6 cm. long and 6–7 cm. wide, with stout rose-colored petioles broadly wing-margined below the middle and 1.2–1.5 cm. in length. Flowers about 1.5 cm. in diameter, on slender elongated villose pedicels, in wide lax many-flowered hairy corymbs, with linear acuminate glandular bracts and bractlets fading brown; calyx-tube narrowly obconic, hairy at the base, glabrous above, the lobes slender, acuminate, entire or slightly and irregularly glandular-serrate, glabrous on the outer, puberulous or villose on the inner surface, reflexed after anthesis; stamens 7–10; anthers pale yellow; styles 2 or 3, surrounded at the base by a narrow ring of pale hairs. Fruit ripening early in September and soon falling, on reddish villose pedicels, in many-fruited drooping clusters, subglobose or often a little longer than wide, crimson, lustrous, marked by occasional large pale dots, 8–10 mm. in diameter; calyx little enlarged, with a narrow shallow cavity and closely appressed lobes villose above and mostly persistent on the ripe fruit; flesh thin, yellow, sweet and succulent; nutlets 2 or 3, full and rounded at the ends, rounded and irregularly ridged on the back, with a low often grooved ridge, penetrated on the inner faces by small narrow cavities, about 6 mm. long and 4 mm. wide.

A shrub 2–3 m. high, with numerous thick ascending stems forming an open irregular head, and very stout slightly zigzag branchlets marked by few large oblong pale lenticels, light orange-green and villose-pubescent when they first appear, becoming nearly glabrous, bright chestnut-red and very lustrous before winter, and dull reddish brown the following season, and armed with numerous stout crimson bright chestnut-brown shining ultimately dull gray spines 4.5–6 cm. long.

Rocky hillsides; Wolf Pen Farm, Southborough, Worcester County, Massachusetts, *C. S. Sargent*, May and September 1904.

This species is named for the late J. Montgomery Sears, by whom it was first shown to me on his farm at Southborough where also grew within an area of a few acres *Crataegus conjuncta*, Sarg., *C. acutiloba*, Sarg., here unusually remote from the coast, *C. fucosa*, Sarg., *C. Thayeri*, Sarg., *C. flabellata*, Spach, the only reported Massachusetts' station for this northern species, *C. intricata*, Lang., and *C. Helenae*, Sarg.

Crataegus ferentaria, Sargent, *Proc. Rochester Acad. Sci.* iv. 135. (1903.)

This species, first noticed in the neighborhood of Rochester, New York, now appears to be one of the most widely distributed New England species.

Maine, Gerrish Island and York Harbor, *Jack*: New Hampshire, Holderness, *C. E. Faxon*: Vermont, New Haven, *Eggleston* (no. 3331) and Middlebury (nos. 3332 and 3334), Waybridge, *Brainerd* (no. 21), and New Haven (no. 23), Twin Mountain, Rutland, *Eggleston* (nos. 2230 and 2332), Lyndonville, *Eggleston* (no. 3398): Massachusetts, West Boylston, North Lancaster and Shirley, *E. F. Thayer*; Wareham, *Outram Bangs* (nos. 2, 3 and 4); Somerset *Jack*, (no. 1); Fall River, *L. H. Handy*; North Adams, *Sargent*: Rhode Island, Tiverton, *Sargent*: Connecticut, Franklin, *Graves* (no. 40): Ontario, near Toronto, *D. W. Beadle* (nos. 104, 105, 106).

In some of the Vermont specimens now referred to this species the anthers in the bud are faintly tinged with pink but are of the normal color soon after the flowers open.

Arnold Arboretum.

AN ANOMALOUS ALPINE WILLOW.

M. L. Fernald.

Gaspé Peninsula in Quebec is, in eastern America at least, the home of the genus *Salix*. There in an area of about 9000 square miles we know twenty-four indigenous species, and two varieties of such pronounced character as to seem perhaps worthy specific rank. Of these twenty-six indigenous willows fourteen are arctic-alpine shrubs of the Shickshock Mountains. Most of these shrubs, *Salix herbacea* L., *S. arctica* Pallas, *S. anglorum* Cham., *S. glauca* L., *S. desertorum* Richards., etc., are clearly referable to well known polar types; but one small ascending shrub occurring on alpine meadows of Mt. Albert and in crevices of serpentine along the headwaters of Ruisseau au Diable seems to be unique among arctic-alpine willows.

Superficially the shrub would be passed as the typical subglabrous *Salix desertorum* which grows along neighboring tributaries of Ruisseau au Diable, but that very beautiful shrub has densely white-pubescent capsules and yellowish chartaceous scales. The little shrub, which in habit, bark and foliage so closely simulates *S. desertorum*, has, instead, strictly glabrous capsules and glabrous green

herbaceous scales. In this scale-character the shrub somewhat approaches *S. retusa* of alpine Europe and its allies of the Himalayas; but unlike them it has the very definite style characteristic of *S. desertorum*, *S. glauca*, and their allies, all species with strongly pubescent capsules. If, as is apparently the case, this little willow is closely related to the superficially similar *S. desertorum* and its allies which abound on Mt. Albert, it would seem that the current tendency, to separate subgenerically species with glabrous from those with pubescent capsules, is at best artificial. Upon that question further study is needed, but since the Mt. Albert shrub with green herbaceous scales is clearly distinct from the described species to which it is apparently related it may be called

Salix **chlorolepis**. Frutex ramosus 0.3–1 m. altus, ramis suberectis griseis 6–8 mm. crassis junioribus badiis lucidis; foliis lanceolatis vel elliptico-oblongis vel auguste obovatis apice et basi subaequaliter attenuatis obtusis vel rotundatis supra viridibus subtus glaucis utrinque primo arachnoideis demum glabratis integris 1–2.5 cm. longis 4–14 mm. latis breviter petiolatis; amentis breviter foliato-pedunculatis ovoideis vel cylindricis 5–13 mm. longis; squamis oblongis vel obovatis subtruncatis vel retusis glabris viridibus subherbaceis 2–3 mm. longis; filamentis pallidis glabris 5 mm. longis, antheris 0.7 mm. longis; capsulis glabris conico-subulatis obtusis obsolete pedicellatis 4 mm. longis; stylis 1.5 mm longis valde fissis, stigmatibus bifidis laciniis elongatis divergentibus. — Quebec, alpine meadows and wet crevices of serpentine, altitude 800–1000 meters, headquarters of Ruisseau au Diable, Mt. Albert, August 12, 1905 (*Collins & Fernald*, no. 59).

Gray Herbarium.

Sclerolepis in New Hampshire. — According to both Gray's and Britton's manuals, *Sclerolepis verticillata*, Cass., ranges from New Jersey southward. Therefore the occurrence of this species in Bradford, N. H., a town some thirty-five miles north of Massachusetts and sixty miles from the coast, is of certain interest. At the southern end of Bradford Pond there is a grove of tall pitch pines separated from the water by a white sandy beach. During the first week of August, this beach was largely occupied by the following plants, all

abundant and in flower,— *Rhexia Virginica*, L.; *Drosera intermedia*, Hayne; *Xyris Caroliniana*, Walt.; *Utricularia cornuta*, Michx.; and *Eriocaulon septangulare*, Withering. *Pogonia ophioglossoides*, Nutt., in fruit was also abundant and showed two late albino blossoms. Along the water's edge, but not immersed, numerous plants of *Sclerolepis verticillata* were found, with flowers almost mature. A comparison of the specimens collected in Bradford with those from southern localities reveals no important differences. The species as it occurs in its more southern habitat is somewhat variable in height, in width of leaf, and in the firmness of the stem, differences depending in part upon whether the individual plants are growing in, or near the water. The Bradford specimens correspond to the shorter form, growing on the sand, and having a firm stem and numerous short leaves. Specimens collected at Bradford have been deposited in the Gray Herbarium of Harvard University.— FREDERIC T. LEWIS, M. D., Cambridge, Massachusetts.

A WORK FOR TEACHERS OF BIOLOGY.—In "The Teaching of Biology"[1] Professor Lloyd and Dr. Bigelow have treated their theme with considerable fulness, great painstaking, and much advantage to teachers of biology. The aims and scope of the book may be seen from the following partial list of chapter subjects: the value of biology in education; nature study; the value of botany in secondary education; various types of botanical courses; principles to be emphasized; detailed discussion of the course; laboratory and materials; botanical literature; the value of zoology; animal nature study and human physiology in the elementary school; the subject matter and the outline of a course for the secondary school; the relation of zoology in secondary school and in college. The full bibliographies and references to pedagogical literature are especially valuable. As regards the class of teachers to whom the work will prove to be of most service, it may be said that the general suggestions and the specific directions to teachers in secondary schools are of most value. The ideals of the authors

[1] The Teaching of Biology in the Secondary School, by Francis E. Lloyd, A. M., and Maurice A. Bigelow, Ph. D., Professors in Teachers' College, Columbia University. New York. Longmans, Green, and Co., pp. 500. Price $1.50.

in respect to the equipment of teachers and the plane upon which instruction should be placed are high. In botany a "synthetic course" is advocated, wherein insistence is laid upon the correlation of morphology and physiology (with ecology), and a dynamic point of view is taken and carried out. As outlined in detail, with many practical helps, by Professor Lloyd, this course agrees well with the recommendations of the committee appointed by the Society for Plant Morphology and Physiology to formulate a uniform college entrance requirement in botany. Schoolmen may well read Dr. Bigelow's arguments in favor of a year's course in biology the botanical and zoological elements of which would be so adjusted that the important general principles of life might be taught to the exclusion of a mass of relatively uninstructive details. — R. G. L.

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THE USE OF ACCENTUAL MARKS IN GRAY'S MANUAL.

Ezra Brainerd.

I cannot refrain from expressing my amazement at a portion of Mr. Pease's article in the September Rhodora. I concur in what he says regarding the proper syllable to receive the accent, and am ready to try to say Hyperīcum and Polygŏn′atum. But on page 160, paragraph marked "2," he passes outside of the subject indicated by his title, to speak of "vowel quantities," and criticises in the Gray Manual the use of certain accentual marks that have stood unchallenged for nearly fifty years.

Surely in the instances cited, with the two exceptions of Pícea and Sapíndus, accepted as genera only in the last edition,[1] these marks are correctly used in the Manual. The proposed changes are in direct violation of long established and well known rules for the English pronunciation of Latin, and would lead us into ridiculous pedantry.

Mr. Pease evidently confuses two very different things, *viz.*: (1) the *ancient* distinction of vowels as "long" or "short" — referring not so much to quality of sound as to *length of time in uttering* the sound; and (2) the *English* distinction of vowels as "long" or "short" — referring to change of *quality*, according, for the most part, as a vowel ends a syllable or is followed by a consonant in the same syllable. Mr. Pease's erudition has enabled him to point out

[1] Dr. Gray himself in the Garden Botany, 1870, pp. 70 & 312 gives these words the correct accentual marks. "*Aegopódum*" in Mr. Pease's list is plainly a misprint for *Aegopodium*.

in the accented syllable of seventy-one generic names the vowel quantity as used in ancient prosody; but this has no bearing whatever upon the English method of pronouncing any of the names in his long list. Dr. Gray (and Dr. Watson and Dr. Britton after him) used the grave accent ` to indicate, not Latin quantity, but that the vowel over which it stood was to have the so-called long English sound; and the acute accent ′ to indicate, not that the vowel was short in Latin prosody, but was to have the "short-vowel" sound when pronounced by the English method.

It is hard to believe that Mr. Pease would have us pronounce Rhus as though spelled Rūse, or Ròsa as though spelled Rŏs′sa, and Thỳmus as though spelled Thy̆m′mus, Àcer as though Ăs′ser, Clématis as Clē-matis, Lílium as Lī-lium. He admits that the English method of pronouncing Latin is "so firmly established in this country for scientific names that nothing short of a revolution in pronunciation could supplant it." But such changes as those just cited are contrary to the first principles of the English method, and decidedly revolutionary; at the same time they are equally far from what is commonly supposed to have been the pronunciation of the ancient Romans.

We have an excellent statement of the rules for pronouncing Latin by the English method in Harkness' Latin Grammar; and the subject is well discussed in most pronouncing dictionaries of Greek and Roman proper names. A few hours' study of these rules would enable our botanists to pronounce names of plants uniformly and consistently. What we hear now is frequently, not the Roman method nor the "continental method," but a medley of these with the English method.

Middlebury College, Middlebury, Vermont.

AN ALPINE ADIANTUM.

M. L. Fernald.

To a botanist who is familiar with the Maidenhair Fern, *Adiantum pedatum*, of rich deciduous woods of New England and the Alleghenies, and who looks upon that species as the northernmost American representative of a large tropical and subtropical genus, it is a

great surprise to find on the Shickshock Mountains of the Gaspé Peninsula a beautiful Adiantum covering hundreds of acres of alpine tableland. There, on the naked tableland of Mt. Albert and along the ice-cold streams of the alpine district, is an Adiantum forming broad bands of blue-green wherever the water from the cold bogs or melting snow-fields trickles through crevices of the greenish-brown serpentine.

Ordinarily the plant is strongly caespitose, very many stiff glaucous stipes springing from the crowns of the firmly entangled rootstocks. These rigid stipes are rarely more than 2 decimeters high, often scarcely 1 dm., though exceptional clumps have stipes fully 2.5 dm. tall. The blue-green fronds are from 0.5 to 2 dm. across, and the pinnae usually strongly ascending, without the long graceful curve which in *A. pedatum* causes the tips of the primary branches nearly to meet. In exposed sunny situations the small firm pinnules are peculiarly twisted, but in sheltered ravines they are quite flat and normal.

The plant is evidently a close ally of our Alleghenian *Adiantum pedatum*, but careful comparison with this plant of the woodlands shows the Mt. Albert fern to have certain characters which are noteworthy. Besides its small stature, ascending scarcely recurved pinnae and very firm texture the Adiantum of the Shickshocks differs in having the lower marginal rib of the pinnules more prominent, while the finer veins of the pinnules are more obscure than in *A. pedatum*. The teeth at the tips of the pinnules of the Mt. Albert plant are acute and often very fine, while those of the Alleghenian *A. pedatum* are rounded. But the best character, perhaps, is in the indusium. In *A. pedatum* this is transversely linear, varying much in length (usually from 2 to 5 mm. long) but always of a linear or short-oblong outline (about 1 mm. broad). In the Mt. Albert plant the indusia are more lunate, rarely twice as long as broad.

Study of the material in the Gray Herbarium shows that the plant of Mt. Albert, though usually dwarfed, is the characteristic Adiantum of wet rocks and mountain-gulches from Idaho and California north to Alaska, where it has passed as *A. pedatum*, and that it reappears in northeastern Asia. It is unquestionably the fern listed without description by Presl as *Adiantum boreale* "(A. pedatum ex Unalaschka *Kaulf. et herb. Chamisso*)."[1] which was afterward taken up and

[1] Presl, Tent. Pterid. 158 (1836).

described by Ruprecht as *A. pedatum*, var. *aleuticum*.[1] Ruprecht's material was from Unalaschka and Kadiak Island, and specimens from that region are clearly identical with those from Mt. Albert. Occasional specimens from northwestern America and some from eastern Asia show very evident transitions to typical *A. pedatum*, and, although he failed in his diagnosis to point out some leading characteristics of the fern, it is probable that Ruprecht's treatment of the plant was best and that it should be known as *Adiantum pedatum* L., var. *aleuticum* Ruprecht.

Gray Herbarium.

RECENTLY RECOGNIZED SPECIES OF CRATAEGUS IN EASTERN CANADA AND NEW ENGLAND, — VI.

C. S. Sargent.

(*Continued from page 185.*)

Punctatae.

Stamens 20; anthers pale rose.

Crataegus umbratilis, n. sp. Leaves obovate to rhombic or suborbicular, acute or short-pointed and acuminate at the apex, gradually narrowed and concave-cuneate at the long entire base, sharply doubly serrate above, with straight glandular teeth, and divided above the middle into 3 or 4 pairs of short broad acute lobes, about half-grown when the flowers open at the end of May and then membranaceous, glabrous with the exception of a few pale hairs along the upper side of the midribs and veins, light yellow-green, smooth and lustrous above and pale below, and at maturity thin, glabrous, dark yellow-green and lustrous on the upper and paler on the lower surface, 6–7 cm. long and 5–7 cm. wide, with thin orange-colored midribs, and slender inconspicuous primary veins extending obliquely to the points of the lobes; petioles slender, broadly wing-margined at the apex, deeply grooved, glabrous, glandular, with occasional scattered persistent glands, 2–3 cm. in length; leaves on vigorous shoots more

[1] Ruprecht, Distrib. Crypt. Vasc. in Imp. Ross. 49 (1845).

coarsely serrate and more deeply lobed and often 3–8 cm. long and broad. Flowers 2–5 cm. in diameter, on long stout glabrous pedicels, in generally 5–12-flowered broad lax corymbs, the lower branches from the axils of upper leaves; calyx broadly obconic, glabrous, tinged with red, the lobes gradually narrowed, short-acuminate, finely glandular-serrate above the middle, green, glabrous on the outer, sparingly villose on the inner surface, reflexed after anthesis; stamens 20; anthers large, pale rose color; styles 5. Fruit ripening in September, on stout erect pedicels, in few-fruited clusters, subglobose to short-oblong, bright apple-green (September 19th), about 1 cm. in diameter; calyx prominent, with a wide deep cavity and small spreading and reflexed lobes hairy on the upper side and mostly persistent; flesh thin, green, dry and mealy; nutlets 5, full and rounded at the base, acute at the apex, rounded or occasionally obscurely ridged on the back, dark-colored, about 7 mm. long and 5–6 mm. wide.

A tree about 5 m. high, with a short trunk 20–25 cm. in diameter, covered with pale gray scaly bark, large spreading and ascending branches forming a wide open irregular head, and slender nearly straight branchlets marked by oblong pale lenticels, glabrous and deeply tinged with red when they first appear, soon becoming light orange-brown, light gray tinged with red in their second year, and armed with numerous slender nearly straight bright chestnut-brown shining spines 3.5–4.5 cm. long, elongated, much-branched, and very abundant on the trunk and branches.

Borders of Alder thickets in low moist ground in the shade of larger trees, Goddard estate near Litchfield, Litchfield County, Connecticut, *C. H. Bissell* (no. 67, type!), September 20, 1903, May, 1904; *Bissell* and *Sargent*, September 3, 1905.

Pruinosae.

Stamens 20; anthers pink.

Crataegus fusca, n. sp. Leaves ovate, acuminate, rounded, cuneate or almost truncate at the broad entire base, sharply often doubly serrate above, with straight glandular teeth, and divided into 4–6 pairs of narrow acuminate spreading lobes, nearly one-third grown when the flowers open about the 1st of June and then thin, yellow-green slightly tinged with red, and glabrous with the exception of a few scattered pale caducous hairs above and pale and glabrous below, and at maturity thin, bluish green and lustrous on the upper and paler blue-green on the lower surface, 4.5–7 cm. long and 4–5.5 cm. wide, with slender yellow midribs, and thin primary veins

arching obliquely to the points of the lobes; petioles slender, slightly wing-margined at the apex, occasionally sparingly glandular, 2–3.5 cm. in length; leaves on vigorous shoots rounded or sometimes cordate at the base, coarsely serrate and more deeply lobed, with stout wing-margined glandular rose-colored petioles. Flowers about 2 cm. in diameter, on short slender glabrous pedicels, in usually 4–7-flowered corymbs, with linear acuminate glandular rose-colored bracts and bractlets mostly deciduous before the flowers open; calyx-tube broadly obconic, the lobes short, gradually narrowed, acuminate, minutely glandular on the margins, glabrous, reflexed after anthesis; stamens 20; anthers pale pink; styles 4 or 5. Fruit ripening the middle of October, on short stout erect pedicels, in few-fruited clusters, short-oblong, full and rounded at the apex, slightly narrowed at the base, dull brown, pruinose, 1–1.2 cm. in diameter; calyx prominent, with a short tube, a broad deep cavity and spreading and reflexed lobes dark red on the upper side below the middle; flesh thin, yellow-green, dry and mealy; nutlets usually 4 or 5, broad and rounded at the base, gradually narrowed and rounded at the apex, ridged on the back, with a high narrow ridge, light-colored, 7–8 mm. long and 4–5 mm. wide.

A tree with a short trunk and spreading branches forming a round-topped head, and slender nearly straight branchlets marked by oblong pale lenticels, orange-green more or less tinged with red when they first appear, bright chestnut-brown and lustrous during their first year and light gray tinged with red the following season, and armed with slender slightly curved purplish shining spines 4–5 cm. long.

Pastures near Burlington, Vermont, *W. W. Eggleston* (nos. 2282, 2346, 2874 type!), September and October 1901, May and June 1902, June 1903.

Anthers rose-color.
Stamens 15–20.

Crataegus Quinebaugensis, n. sp. Leaves rhombic, acuminate, cuneate and entire at the base, finely often doubly serrate above, with slender glandular teeth, and divided above the middle into 2 or 3 pairs of broad short acuminate lobes, nearly one-third grown when the flowers open about the 20th of May and then thin and glabrous, light yellow-green and very smooth above and pale bluish green below, and at maturity subcoriaceous, dark blue-green and lustrous on the upper and pale blue-green on the lower surface, 6–7 cm. long and 5–6 cm. wide, with slender yellow midribs, and thin primary veins extending obliquely to the points of the lobes; petioles slender, slightly wing-margined at the apex, nearly terete, glandular, with minute dark red stipitate deciduous glands, 2–3 cm. in length; stip-

ules linear-obovate, glandular, fading rose color or brown, mostly fallen before the flowers open; leaves on vigorous shoots more coarsely serrate and more deeply lobed, often 8–10 cm. long and 7–8 cm. wide, with stout petioles conspicuously glandular through the season, and foliaceous lunate coarsely serrate persistent stipules. Flowers 1.6–1.9 cm. in diameter, on elongated slender glabrous pedicels, in usually 5–7-flowered corymbs, with linear-obovate acuminate glandular bracts and bractlets usually persistent until after the flowers open; calyx-tube broadly obconic, glabrous, the lobes wide, short-acuminate, usually dentate above the middle, with minute glandular teeth, reflexed after anthesis; stamens 15–20, usually 16–18; anthers pale rose color; styles 3–5. Fruit ripening in October and falling before the end of the month, on slender pendulous pedicels, in few-fruited clusters, oblong to slightly obovate, usually pointed and more or less angled at the base, gradually narrowed at the apex, light red or purplish, pruinose, 1–1.2 cm. long and 8–9 mm. wide; calyx little enlarged, with a short tube, a deep narrow cavity, and spreading and reflexed usually persistent lobes; flesh thin, hard and dry, greenish or yellowish white, sometimes tinged with red; nutlets 3 or 4, narrowed at the ends, acute at the apex, ridged on the back, with a low broad slightly grooved ridge, about 8 mm. long and 4–5 mm. wide.

A sparingly branched shrub 2–4 m. high, with long spreading and ascending stems covered with pale gray bark darker and rougher near their base, and stout zigzag branchlets marked by small oblong dark lenticels, orange-brown and glabrous when they first appear, dull olive or olive-brown during their first year, becoming gray-brown the following season, and armed with many slender slightly curved purplish shining spines 5–7 cm. long.

Near Hopeville, New London County, Connecticut, in the valley of the Quinebaug River, *C. B. Graves* (no. 57 type!), May, July and October 1904.

Stamens 10 or less.

Crataegus bellula, Sarg., *Trees and Shrubs*, i. 111, t. 56. (1903.) I have referred to this species, known previously only in the neighborhood of Grand Rapids, Michigan, a large nearly aborescent plant discovered in Somerset, Massachusetts, by Mr. J. G. Jack (no. 6), May and September 1903. If this reference is correct *Crataegus bellula* is interesting as another instance of the occurrence of a species of this genus in remote regions without intermediate stations, for the country between southern Massachusetts and central Michigan has been so carefully examined for Crataegus that it is hardly prob-

able that such a distinct and beautiful plant as *C. bellula* could if generally distributed have escaped notice.

Crataegus incisa, n. sp. Leaves ovate-oblong, acuminate, cuneate or rounded at the entire glandular base, sharply doubly serrate above, with straight or incurved glandular teeth, and deeply divided into numerous narrow acuminate spreading sometimes reflexed lateral lobes, more than half grown when the flowers open from the 20th to the end of May and then membranaceous, light yellow green, smooth and glabrous above, and pale or glaucous and slightly hairy along the midribs and veins below, and at maturity subcoriaceous, dark blue-green and lustrous on the upper and pale-green on the lower surface, 5–8 cm. long and 4–6 cm. wide, with prominent yellow midribs, and slender obscure primary veins arching obliquely to the points of the lobes; petioles slender, slightly wing-margined at the apex, nearly terete, yellow, sometimes glandular while young, with minute dark red deciduous glands, 2–3 cm. in length; leaves on vigorous shoots ovate, truncate or rounded at the broad base, coarsely serrate, 3-lobed by deep narrow sinuses, the terminal lobe incisely lobed, coriaceous, 7–9 cm. long and wide, with stout winged conspicuously glandular petioles, and foliaceous lunate long-pointed laciniately divided stipules. Flowers 1.8–2 cm. in diameter, on slender elongated glabrous pedicels, in lax 4–6-flowered corymbs, with linear acuminate glandular bracts and bractlets, fading brown and mostly deciduous before the flowers open; calyx-tube narrowly obconic, glabrous, the lobes gradually narrowed from wide bases, acute and glandular at the apex, entire or finely glandular-serrate near the middle, glabrous, reflexed after anthesis; stamens 5–10; anthers pale rose color; styles usually 3, surrounded at the base by a narrow ring of pale hairs. Fruit ripening late in October, and persistent until after the fall of the leaves on erect or spreading pedicels, in compact few-fruited clusters, obovate, full and rounded at the apex, gradually narrowed to the base, green covered with a glaucous bloom, late in the season often becoming crimson or tinged with crimson, 1.3–1.5 cm. long and 1–1.2 cm. wide; calyx little enlarged, without a tube, and with a narrow shallow cavity and spreading lobes, their tips often deciduous from the ripe fruit; flesh thin, hard and green; nutlets 3, gradually narrowed to the rounded ends, ridged on the back, with a broadly grooved ridge, about 8 mm. long and 5 mm. wide.

A shrub or small tree 3–4 m. high, with slender stems, and stout slightly zigzag branchlets marked by small dark lenticels, green tinged with red when they first appear, soon becoming bright red-brown and very lustrous, and dark dull gray-brown in their second year, and armed with slender straight or slightly curved shining spines 3.5–5 cm. long.

In dry soil near ledges, Stratford, Fairfield County, Connecticut,

E. H. Eames (nos. 144 type! 3495 and 3595), June and September 1901, May and September 1903.

Crataegus Robbinsiana, n. sp. Leaves ovate, acute or acuminate, rounded, truncate or cordate at the entire or crenate base, finely doubly serrate above, with straight glandular teeth, and more or less divided into 4 or 5 pairs of spreading acuminate lateral lobes, when they unfold deeply tinged with red, glabrous below and furnished above with short white hairs, nearly fully grown when the flowers open from the middle to the 20th of May and then membranaceous, pale yellow-green and still hairy above and pale below, and at maturity thin but firm in texture, smooth and dark green on the upper, pale on the lower surface, 3–5 cm. long and 2.5–3.5 cm. wide, with slender yellow midribs, and thin primary veins extending obliquely to the points of the lobes, often turning orange color tinged with red in the autumn before falling; petioles slender, slightly wing-margined at the apex, glandular, with minute stipitate dark glands, 1.4–2 cm. in length; stipules linear to linear-falcate, acuminate, finely glandular-serrate, mostly deciduous before the flowers open; leaves on vigorous shoots broadly ovate, mostly long-pointed, cordate or rarely truncate at the base, more coarsely serrate, more deeply lobed and frequently 6–7 cm. long and 5–6 cm. wide, with stout reddish conspicuously glandular petioles 1–2 cm. long. Flowers 1.2–1.5 cm. in diameter, on slender glabrous pedicels, in 6–10-flowered corymbs, with linear glandular bracts and bractlets fading brown and mostly deciduous before the flowers open; calyx-tube broadly obconic, glabrous, the lobes gradually narrowed from wide bases, acuminate at the gland-tipped apex, entire or slightly and irregularly toothed near the middle, reflexed after anthesis; stamens 7–10; anthers light rose color; styles 4 or 5, surrounded at the base by a ring of pale tomentum. Fruit ripening from the first to the middle of October, on slender pedicels, in few-fruited erect clusters, depressed-globose, rather broader than high, dull red and slightly pruinose, becoming lustrous and about 1.2 cm. in diameter; calyx little enlarged, without a tube, and with a deep narrow cavity, and spreading appressed lobes bright red on the upper side below the middle and mostly persistent on the ripe fruit; flesh thin, hard, greenish white; nutlets 4 or 5, full and rounded at the base, narrow and rounded at the apex, ridged on the back, with a high ridge, 6–7 mm. long and 4–5 mm. wide.

A tree occasionally 10 m. high, with a tall trunk 20–25 cm. in diameter, covered with light gray closely appressed scales, comparatively small erect branches forming an open erect head, and slender slightly zigzag branchlets marked by numerous dark lenticels, green tinged with red and glabrous when they first appear, bright chestnut-brown and lustrous during their first winter and pale gray-brown the following season, and armed with many slender or occasionally

stout nearly straight bright red-brown shining spines 3–4 cm. long; usually smaller and sometimes shrubby in habit.

Burlington, Vermont, *W. W. Eggleston* (no. 3475 type!), October 1903, May 1904, (no. 3472) October 1903, *A. W. Edson*, May 1900. Putney, Vermont, *W. W. Eggleston* (nos. 3391 & 3392), May and September 1903, *W. H. Blanchard* (no. 46), May and September 1903; Westminster, Vermont, *W. H. Blanchard* (no. 49), September 1902, May 1903; *Blanchard* and *Sargent*, May 1905. North Walpole, New Hampshire, *W. H. Blanchard* (no. 48), May and September 1903.

This handsome and widely distributed species is named in memory of James Watson Robbins (1801–1879) in his time "the most critical student of the botany of New England and the northern Atlantic States."

Crataegus levis, n. sp. Leaves ovate to oval, acute or acuminate, abruptly cuneate or rounded at the entire base, finely doubly serrate above, with straight or incurved glandular teeth, and slightly divided above the middle into 4 or 5 pairs of short acuminate lobes, when the flowers open during the last week of May thin, glabrous with the exception of a few soft hairs on the light yellow-green very smooth upper surface and pale or glaucous and glabrous below, and at maturity thin, but firm in texture, glabrous, blue-green above and pale blue-green below, 3.5–4.5 cm. long and 3–3.5 cm. wide, and on vigorous shoots sometimes 6 cm. long and 4–5 cm. wide, with very slender yellow midribs, and thin primary veins arching obliquely to the points of the lobes; petioles slender, nearly terete, glandular while young, with occasional minute dark red glands, often tinged with red early in the season, 2–3 cm. in length. Flowers 1.2–1.4 cm. in diameter, on stout elongated glabrous pedicels, in usually 5–8-flowered corymbs; calyx-tube narrowly obconic, glabrous, the lobes gradually narrowed from wide bases, short, acuminate, obscurely serrate near the middle, glabrous, reflexed after anthesis; stamens 7–10; anthers deep rose color; styles 3 or 4. Fruit ripening the end of September, on drooping pedicels, in few-fruited clusters, obovate, full and rounded at the apex, gradually narrowed to the slender base, dull purple, very glaucous, 1.1–1.3 cm. long and 7–8 mm. wide; calyx little enlarged, with a wide shallow cavity, and spreading or reflexed serrate lobes dark red on the upper side toward the middle, their tips often deciduous from the ripe fruit; flesh thin, yellow, rather juicy; nutlets 3 or 4, usually 3, narrowed and rounded at the base, acute or acuminate at the apex, ridged on the back, with a high usually broad ridge, about 7 mm. long, and 4–5 mm. wide.

A slender shrub about 2 m. high, with small ascending stems and

branches covered with dark scaly bark, and slender nearly straight branchlets marked by small oblong lenticels, dull orange color and glabrous when they first appear, light chestnut-brown and lustrous during their first winter and dull reddish brown in their second year, and armed with slender nearly straight light chestnut-brown shining ultimately dull gray-brown spines 3–4 cm. long.

Moist rich pastures, Litchfield, Litchfield County, Connecticut, *C. H. Bissell* (no. 71 type!), September 1903, May 1904; *Bissell* and *Sargent*, September 1905.

TENUIFOLIAE.

Anthers rose color.

Stamens 10 or less.

Crataegus culta, n. sp. Leaves ovate, acuminate, broad and rounded at the entire base, finely doubly serrate above, with straight glandular teeth, and slightly divided into 5 or 6 pairs of slender acuminate lobes, about half grown when the flowers open the middle of May and then dark yellow-green and roughened above by short white hairs and pale bluish green and glabrous below, and at maturity thick and firm, glabrous, dark blue-green on the upper and paler on the lower surface, 4–5 cm. long and 3–4 cm. wide, with stout midribs rose-colored below toward the base in the autumn, and slender obscure primary veins extending obliquely to the points of the lobes; petioles slender, grooved and sparingly villose while young on the upper side, soon glabrous, glandular, with minute dark often persistent glands, rose-colored in the autumn, 1.5–3 cm. in length. Flowers about 1.5 cm. in diameter, on slender elongated glabrous pedicels, in broad lax usually 10–12-flowered corymbs, with linear glandular caducous bracts and bractlets; calyx-tube narrowly obconic, glabrous, the lobes slender, long-pointed and acuminate at the rose-colored glandular apex, entire or sparingly dentate near the middle, glabrous, reflexed after anthesis; stamens 5–10; filaments rose color, persistent on the fruit; anthers dark rose color; styles 3 or 4. Fruit ripening and falling late in September, on slender drooping pedicels, in few-fruited clusters, short-oblong or ovate to subglobose, depressed at the insertion of the stalk, crimson, lustrous, marked by minute pale dots, 1–1.3 cm. long; calyx little enlarged with a narrow deep cavity, and spreading or reflexed lobes abruptly narrowed from broad bases, long-pointed, entire or obscurely and irregularly dentate, dark red on the upper side below the middle, mostly persistent on the ripe fruit; flesh thin, slightly juicy, greenish yellow; nutlets usually 3, rounded at the ends or, when 4, acute at the apex, ridged on the back, with a broad low grooved ridge, dark-colored, about 5 mm. long and nearly as wide.

A shrub 3–4 m. high, with long slender much branched stems forming an open irregular head, and slender nearly straight branchlets marked by crowded pale lenticels, dark green tinged with red when they first appear, becoming purple and rather lustrous during their first season and dull reddish brown the following year, and armed with short purplish shining ultimately gray spines 3–4 cm. long and persistent on the old branches and stems.

Rich moist hillsides, Shirley, Middlesex County, Massachusetts, *C. S. Sargent* (no. 5 type!), September 1902, *E. F. Thayer*, September 1904, May and June 1905. *Thayer* and *Sargent*, September 1905.

Crataegus Damei, n. sp. Leaves oblong-ovate or rarely oval, long-pointed and acuminate at the apex, rounded or cuneate at the entire base, sharply doubly serrate above, with slender glandular teeth, and divided into 5 or 6 pairs of narrow acuminate lobes usually pointing forward, deeply tinged with red when they unfold, nearly fully grown when the flowers open the middle of May and then membranaceous, yellow-green and roughened above by short rigid hairs and pale or glaucous and glabrous below, and at maturity very thin, dark blue-green and smooth or slightly roughened above and pale below, 4.5–5.5 cm. long and 3.5–4 cm. wide, with slender yellow midribs, and thin primary veins arching obliquely to the points of the lobes; petioles slender, grooved on the upper side, glabrous, 2–2.5 cm. in length; leaves on vigorous shoots broader in proportion to their length and often truncate at the base. Flowers about 1.5 cm. in diameter, on slender elongated glabrous pedicels, in compact usually 5–7-flowered corymbs; calyx-tube narrowly obconic, glabrous, the lobes slender, entire, acuminate, red and glandular at the acuminate apex, glabrous on the outer, slightly villose on the inner surface, reflexed after anthesis; stamens 10; anthers light pink; styles 2–4, surrounded at the base by a narrow ring of pale hairs. Fruit ripening at the end of September, on long slender drooping pedicels, in many-fruited clusters, oblong to obovate, gradually narrowed at the base, full and rounded at the apex, bright cherry red and lustrous, marked by numerous minute dots, 1.3–1.5 cm. long, about 8 mm. wide; calyx small, with a deep narrow cavity, and slender entire lobes red on the upper side below the middle and spreading or incurved; flesh thin, yellow, rather juicy; nutlets 2–4, narrowed and rounded at the base, acute at the apex, ridged on the back, with a high narrow ridge, about 7 mm. long and 4 mm. wide.

A shrub 4–5 m. high, with numerous slender spreading stems forming a wide open head, and very slender nearly straight branchlets marked by small dark lenticels, light orange-green and glabrous when they first appear, becoming chestnut-brown and somewhat lustrous during their first winter, dull reddish brown the following year, ulti-

mately ashy gray, and armed with occasional stout straight curved purplish spines 1.5–3 cm. long.

Banks of the Merrimack River near Lowell, Massachusetts, *Dame* and *Sargent*, September 1902, *C. S. Sargent*, May 1905.

This species, well distinguished by its very thin dark blue-green leaves and long narrow mostly pear-shaped fruits hanging on long slender stalks is named for the late Lorin Low Dame (1838–1903), one of the authors of *The Flora of Middlesex County, Massachusetts*, of *Typical Elms and other Trees of Massachusetts*, and of a *Handbook of the Trees of New England*, by whom it was first pointed out to me.

Crataegus serena, n. sp. Leaves ovate, acuminate, concave-cuneate or sometimes rounded at the broad base, finely often doubly serrate, with straight or incurved glandular teeth, and divided into 4 or 5 pairs of short broad acute spreading lobes, when they unfold deeply tinged with red especially on the lower surface and covered above with soft white hairs, about one-third grown when the flowers open from the 20th to the end of May and then thin, yellow-green and scabrate above and pale and glabrous below, and at maturity thin but firm in texture, dark dull yellow-green on the upper and paler on the lower surface, 5–6.5 cm. long and 3–5 cm. wide, with stout yellow midribs, and thin prominent primary veins arching obliquely to the points of the lobes; petioles slender, wing-margined at the apex, nearly terete, glabrous, glandular near the apex, with minute often persistent glands, 2–3 cm. in length; stipules linear-obovate, acute, glandular, fading brown, caducous; leaves on vigorous shoots long-pointed and divided by wide shallow sinuses, often 6–7 cm. long and wide, with stout conspicuously glandular rose-colored petioles. Flowers 1.5–1.7 cm. in diameter, on slender glabrous pedicels, in broad lax long-branched many-flowered crowded corymbs, with linear glandular caducous bracts and bractlets; calyx-tube narrowly obconic, glabrous, the lobes slender, acuminate, glandular on the margins and at the apex with large dark red glands, glabrous, spreading or reflexed after anthesis; stamens usually 7; anthers rose-colored; styles 3. Fruit on long slender drooping pedicels, in few-fruited clusters, oblong, full and rounded at the ends, scarlet, lustrous, marked by large pale lenticels, about 1.5 cm. long and 1 cm. wide; calyx enlarged, with a deep narrow cavity, and incurved slightly serrate lobes mostly persistent on the ripe fruit; flesh yellow, soft and sweet; nutlets 3, gradually narrowed and rounded at the ends, ridged on the back, with a broad, high ridge, about 7 mm. long and 4–5 mm. wide.

A shrub sometimes 5–7 m. high, with numerous slender erect many-branched stems spreading into broad thickets, and slender nearly straight branchlets marked by small pale lenticels, dark green tinged with red when they first appear, becoming light chestnut-red

and rather lustrous in their first season and light gray-brown the following year, and armed with numerous slender nearly straight bright red-brown shining spines usually 2–3 cm. long.

Roadsides and pastures, Lenox, Berkshire County, Massachusetts, common, *C. S. Sargent*, September and October 1902, May 1904.

Crataegus Paddockeae, n. sp. Leaves oblong ovate to oval, long-pointed and acuminate at the apex, full and rounded or rarely cuneate at the glandular base, finely doubly serrate above, with straight glandular teeth, and slightly divided into 5 or 6 pairs of small narrow acuminate lateral lobes, when they unfold slightly tinged with red, roughened above by short white hairs and glabrous below, more than half grown when the flowers open about the 20th of May and then very thin, light yellow-green and scabrate above, pale and glaucous below, and at maturity thin but firm in texture, dark yellow-green, smooth and lustrous on the upper and pale on the lower surface, 5.5–7 cm. long and 4.5–5 cm. wide, with stout yellow midribs, and slender primary veins arching obliquely to the points of the lobes, petioles slender, slightly wing-margined at the apex, nearly terete, glabrous, glandular, with scattered persistent glands, rose-colored in the autumn, 2–2.5 cm. in length; leaves on vigorous shoots often cordate at the base, coarsely serrate, more deeply lobed, with broad, spreading lobes, thick and leathery, often 7–8 cm. long and broad, with dark rose-colored midribs and stout conspicuously glandular petioles. Flowers small (petals not seen), on slender elongated glabrous pedicels, in mostly 10–12-flowered corymbs; calyx-tube narrowly obconic, glabrous, the lobes slender, acuminate and red at the apex, entire, or sparingly glandular near the middle, glabrous on the outer, slightly villose on the inner surface, reflexed after anthesis; stamens 10; anthers small, rose color; styles 3 or 4. Fruit ripening by the middle of September, on slender elongated reddish drooping pedicels, in few-fruited clusters, short-oblong to obovate, full and rounded at the apex, narrowed below, lustrous, 1–1.2 cm. long, 8–10 mm. wide; calyx little enlarged, with a wide deep cavity and closely appressed lobes slightly hairy on the upper side, persistent on the ripe fruit; nutlets 3 or 4, full and rounded at the base, gradually narrowed and rounded or acute at the apex, irregularly ridged on the back, with a high slightly grooved ridge, 6–7 mm. long and about 4 mm. wide.

A shrub 5–6 m. high, with numerous stems, spreading branches, and slender slightly zigzag branchlets marked by numerous small pale lenticels, dark orange-yellow and glabrous when they first appear, light chestnut-brown and very lustrous during their first winter and dull dark red-brown the following year, and armed with many slender straight or slightly curved bright chestnut-brown shining spines 4–6 cm. long and usually pointed toward the base of the branch.

Valley of the Passumpsic River, Essex County, Vermont, *W. W. Eggleston*, north of Lyndonville (no. 3400 type!), Bloomfield (no. 3406).

This species is named for Miss Isabel Monteith Paddock, curator of the botanical department of the Fairbanks Museum of Natural Science, St. Johnsbury, Vermont.

Crataegus Napaea, n. sp. Leaves oblong-ovate, abruptly narrowed and long-pointed at the acuminate apex, rounded at the gradually narrowed base, sharply often doubly serrate, with straight glandular teeth, and deeply divided into 4 or 5 pairs of acuminate spreading lobes, more than half-grown when the flowers open about the 20th of May and then membranaceous, dark yellow-green, covered with short white hairs, and smooth and lustrous above and pale below, and at maturity thin, yellow-green and lustrous on the upper and pale on the lower surface, 7–9 cm. long and 5–7 cm. wide, with thin orange-colored midribs, and slender primary veins arching obliquely to the points of the lobes; petioles slender, wing-margined at the apex, nearly terete, glandular, with scattered persistent glands, rose-colored in the autumn, 3.5–4 cm. in length; leaves on vigorous shoots longer-pointed, often gradually narrowed and cuneate at the base, coarsely serrate, deeply lobed, often 9–10 cm. long and occasionally not more than 5–6 cm. wide, with stout broadly winged petioles. Flowers small (petals not seen), on long slender glabrous pedicels, in lax many-flowered corymbs, the lower branches from the axils of upper leaves; calyx narrowly obconic, glabrous, the lobes slender, elongated, acuminate, red at the apex, entire or sharply serrate near the middle, glabrous, reflexed after anthesis; stamens 5–7; filaments persistent on the fruit; anthers rose-colored; styles 3 or 4, usually 4. Fruit ripening about the 20th of September, on long slender drooping pedicels, in few-fruited clusters, oblong-obovate, dull red, 1–1.2 cm. long and 8–9 mm. wide; calyx prominent, with a wide shallow cavity, and small closely appressed persistent lobes; flesh thick, yellow, dry and mealy; nutlets usually 4, gradually narrowed and acute at the ends, very slightly ridged on the rounded back, 6–7 mm. long and about 5 mm. wide.

An arborescent shrub 5–6 m. high, with numerous stout ascending much branched stems spreading into broad thickets, and slender nearly straight branchlets marked by numerous small pale lenticels, dark olive-green tinged with red when they first appear, light chestnut-brown and lustrous during their first winter and dull reddish brown in their second year, and armed with slender nearly straight or curved light chestnut-brown shining spines 4–5 cm. long.

Low moist soil near the banks of a deep ravine on the Goddard Estate, near Litchfield, Litchfield County, Connecticut, *C. H. Bissell*

(no. 68 type!), May and September 1904, *Bissell* and *Sargent*, September 1905; Cornwall, Connecticut, *C. H. Bissell* (no. 54), May and September 1903.

Crataegus viridimontana, n. sp. Leaves ovate, long-pointed and acuminate at the apex, gradually narrowed and concave-cuneate at the glandular base, finely doubly serrate above, with incurved glandular teeth, and deeply divided into 5 or 6 pairs of slender acuminate spreading lobes, when they unfold tinged with red and coated with silky white hairs more abundant on the lower than on the upper side, nearly half grown when the flowers open about the 25th of May and then membranaceous, light yellow-green and roughened above by short white hairs and pale and glabrous below, and at maturity thick and firm in texture, dark green, lustrous and scabrate on the upper and pale on the lower surface, 5–5.5 cm. long and 4–5 cm. wide, with slender yellow midribs, and thin primary veins arching obliquely to the points of the lobes; petioles slender, slightly wing-margined at the apex, glabrous, glandular toward the apex, rose-colored when they first appear, soon yellow, 2.5–3 cm. in length; stipules linear, glandular, fading rose color, caducous; leaves on vigorous shoots oblong-ovate to rhombic, long-pointed, cuneate at the base, coarsely serrate, deeply divided into broad spreading lobes, 7–9 cm. long and 5–7 cm. wide, with stout broadly winged conspicuously glandular petioles, and foliaceous lunate coarsely glandular-serrate persistent stipules. Flowers 1.6 cm. in diameter, on long slender glabrous pedicels, in mostly 5–9-flowered corymbs, with linear glandular caducous bracts and bractlets; calyx-tube narrowly obconic, glabrous, the lobes gradually narrowed from wide bases, elongated, acuminate and glandular at the apex, entire or sparingly glandular toward the middle, glabrous, reflexed after anthesis; stamens 5–10; anthers large, dark rose color; styles 2–4, usually 4, surrounded at the base by a narrow ring of pale tomentum. Fruit ripening from the middle to the end of August and persistent for nearly another month, on slender elongated reddish pedicels, in few-fruited drooping clusters, short-oblong, full and rounded at the ends, crimson, slightly pruinose, marked by numerous small pale dots, 1.2–1.5 cm. long and about 1 cm. wide; calyx little enlarged, with a deep narrow cavity, and erect often incurved lobes only slightly glandular-serrate toward the base; flesh yellow, thick, soft and succulent; nutlets usually 4, gradually narrowed at the ends, rounded at the base, often acute at the apex, prominently ridged on the back, with a wide grooved ridge, dark-colored, 6–7 mm. long and about 5 mm. wide.

A shrub 5–7 m. high, with slender ascending stems forming an open irregular head, and stout nearly straight branchlets marked by numerous small pale lenticels, orange-green and glabrous when they first appear, bright chestnut-brown and very lustrous during their first winter, becoming pale gray-brown, and armed with numerous

stout nearly straight light chestnut-brown shining spines 3–3.5 cm. long.

In shady upland woods, East Middlebury, Vermont *Ezra Brainerd* (no. 109 type!), July and September 1900, May, July and August, 1901.

This species differs from *C. matura*, Sarg., to which it was first doubtfully referred, in its larger and more deeply lobed and much thicker leaves, larger fruit, and in its habit. As noted by President Brainerd *C. viridimontana*, more than any other species of western Vermont, grows in woods in the dense shade of other trees.

Stamens 18–20.

Crataegus Edsoni, n. sp.

Crataegus matura, Sarg., Rhodora, iii. 24 (1901) so far as relates to the flowers (see Rhodora, v. 144).

Leaves oblong-ovate to oval, acuminate, gradually narrowed and rounded or cuneate at the base, sharply often doubly serrate, with straight or incurved glandular teeth, and divided above the middle into 4 or 5 pairs of short broad acuminate spreading lobes, when they unfold deeply tinged with red and roughened above by short white hairs and sparingly villose below along the midribs and veins, when the flowers open during the last week in May membranaceous, light yellow-green above and pale below, and at maturity thin, dark yellow and smooth on the upper and paler on the lower surface, 6–8 cm. long and 5–6 cm. wide, with slender yellow midribs, and thin veins extending obliquely to the points of the lobes, turning dull orange color early in the autumn; petioles slender, narrowly wing-margined at the apex, nearly terete, glandular above the middle, with large persistent glands, 2–3 cm. in length; stipules linear, acuminate, glandular, caducous, leaves on vigorous shoots long-pointed, coarsely serrate, more deeply lobed, often 8–9 cm. long and 7 cm. wide, with stout petioles broadly winged to below the middle and often rose-colored toward the base in the autumn. Flowers about 1.8 cm. in diameter, on long slender glabrous pedicels, in compact usually 7- or 8-flowered corymbs, with linear-obovate glandular bracts and bractlets; calyx-tube narrowly obconic, glabrous, the lobes slender, red and glandular at the acuminate apex, entire or occasionally dentate near the base, glabrous, reflexed after anthesis; stamens 18–20; filaments persistent, dark red and conspicuous on the fruit; anthers pink; styles 3–5, surrounded at the base by a narrow ring of pale tomentum. Fruit ripening early in September, on slender drooping reddish pedicels, in many-fruited clusters, subglobose to short-oblong on obovate, bright cherry red, lustrous, marked by small pale dots, 1.3–1.5 cm. in diameter; calyx little enlarged, with a broad deep cav-

ity, and small closely appressed lobes dark red on the upper side below the middle, often deciduous from the ripe fruit; flesh thin, yellow, acidulous, of agreeable flavor; nutlets 3–5, narrowed and rounded at the ends, ridged, with a low narrow ridge, or rounded and grooved on the back, about 7 mm. long and 4–5 mm. wide.

A broad shrub, with spreading stems 2–3 m. high forming large clumps, slender nearly straight branchlets marked by small pale lenticels, light orange-yellow more or less tinged with red and glabrous when they first appear, dark orange-brown and lustrous in their first season and dull grayish or reddish brown the following year, and armed with numerous stout nearly straight bright chestnut-brown shining spines 2.5–3.5 cm. long.

Pastures in low moist soil, Burlington, Vermont, *A. W. Edson*, May 1900, *W. W. Eggleston* (nos. 2280 & 2870 type !), September 1901, May 1902, (nos. 2344 & 3476), May and October 1903; Westminster, Windham County, Vermont, *W. H. Blanchard* (no. 78), May and September 1903; North Walpole, Cheshire County, New Hampshire, *W. H. Blanchard* (no. 34), September 1902, May 1903, *W. W. Eggleston* (no. 2928), October 1902, May and September 1903; Lansingburg, Rensselaer County, New York, *Charles H. Peck* (no. 15 b), May and September 1903.

Crataegus Edsoni appears to be most closely related to *C. Forbesae*, Sarg., of central Massachusetts and Connecticut, differing from that species in its thinner and more deeply lobed leaves, pink, not dark red, anthers, and larger fruit. It is named for its discoverer, the late Arthur Woodbury Edson, a student at the University of Vermont and at the time of his death in June 1905 assistant physiologist in the Bureau of Plant Industry of the Department of Agriculture of the United States, in charge of experiments in Texas in breeding cotton. (See *Science*, n. ser. XXII. 61.)

Molles.

Stamens 10; anthers pale pink.

Crataegus lauta, n. sp. Leaves ovate, acuminate, broad and rounded or truncate or occasionally cuneate at the entire base, sharply doubly serrate above, with straight glandular teeth, and slightly divided into 5 or 6 pairs of small acuminate lateral lobes, about ⅓ grown when the flowers open from the 15th to the 20th of May and then membranaceous, yellow-green and roughened above

by short white hairs and villose below along the midribs and veins, and at maturity thin, bluish green and scabrate on the upper and yellow-green on the lower surface, 6–7 cm. long and 5–6 cm. wide, with stout yellow midribs, and slender sparingly villose or pubescent primary veins; petioles slender, wing-margined at the apex, nearly terete, villose through the season, tinged with rose color at the base in the autumn, 2.5–3 cm. in length; stipules lanceolate, glandular, caducous; leaves on vigorous shoots slightly cordate at the broad base, coarsely serrate, more deeply lobed, thicker, often 10–12 cm. long and 8–9 cm. wide, with stout broadly winged conspicuously glandular petioles, and foliaceous lunate coarsely serrate persistent stipules. Flowers 2 cm. in diameter, on slender elongated villose pedicels, in compact hairy usually 8-12-flowered corymbs, with oblong-obovate to linear glandular bracts and bractlets mostly persistent until the flowers open; calyx tube narrowly obconic, clothed with matted pale hairs, the lobes broad, acuminate, coarsely glandular serrate usually only below the middle, glabrous on the outer, villose on the inner surface, reflexed after anthesis; stamens 10; anthers pale pink; styles 5, surrounded at the base by a narrow ring of pale tomentum. Fruit ripening at the end of September, on stout slightly villose drooping pedicels, in few-fruited clusters, short-oblong to oblong, full and rounded and pubescent at the ends, slightly concave at the insertion of the pedicels, bright orange-red, lustrous, marked by numerous small dark dots, 1.6–2 cm. long and 1.5–1.8 cm. wide; calyx only little enlarged, with a deep narrow cavity, and erect laciniately glandular-serrate lobes rose-colored on the inner side toward the base and persistent on the ripe fruit; flesh thick, yellow, slightly juicy, firm and hard; nutlets 5, narrow and rounded at the base, acute at the apex, slightly and irregularly ridged on the back, 8–9 mm. long and 5–6 mm. wide.

A pyramidal arborescent shrub, with erect stems covered with ashy gray bark, small spreading and ascending branches, and stout slightly zigzag branchlets marked by many small lenticels, green slightly tinged with red and sparingly villose when they first appear, soon glabrous and dark olive green and lustrous, light olive green in their second season, and armed with many stout nearly straight light chestnut-brown shining spines 4–5 cm. long.

The description of this plant is drawn from a specimen cultivated in Olmsted Park, Boston. This is one of 700 plants, all similar in habit and foliage and in the characters of the flowers and fruit planted in the Boston parks and raised about fifteen years ago at the Framingham nurseries in South Framingham, Massachusetts, from seeds produced by a plant still growing in the Harvard Botanic Garden. The origin of this plant is unknown. It is one of a collec-

tion of thorns, however, planted by me in the garden perhaps about 1875 and, like other trees and shrubs planted there at that time, it was probably raised from seeds at the Arnold Arboretum.

Flabellatae.

Stamens 5; anthers rose color.

Crataegus ampla, n. sp. Leaves ovate, acuminate, rounded, truncate or rarely cuneate at the base, sharply often doubly serrate, with slender straight glandular teeth, and divided into 5 or 6 pairs of broad acuminate lateral lobes, slightly tinged with red and villose on the upper surface when they unfold, nearly half grown when the flowers open about the 20th of May and then membranaceous, light yellow-green and roughened above by short lustrous white hairs and pale and glabrous below, and at maturity thin, dark yellow-green and scabrate on the upper and paler on the lower surface, 6–7 cm. long and 5–6.5 cm. wide, with stout yellow midribs, and slender primary veins arching obliquely to the points of the lobes; petioles slender, nearly terete, glabrous, glandular near the apex, with occasional minute usually persistent glands, rose-colored in the autumn, 1.5–3 cm. in length; stipules oblong-obovate, often falcate, glandular, fading brown, caducous; leaves on vigorous shoots truncate or slightly cordate at the base, more coarsely serrate and more deeply lobed, and 7–8 cm. long and broad. Flowers about 1.5 cm. in diameter, on slender elongated glabrous pedicels, in usually 7–10-flowered corymbs, with oblong-obovate to linear glandular rose-colored bracts and bractlets; calyx-tube broadly obconic, glabrous, the lobes wide, foliaceous, acuminate, coarsely laciniately serrate, glandular, with large dark red glands, glabrous on the outer, sparingly villose on the inner surface, spreading or reflexed after anthesis; stamens 5; anthers dark rose color; styles 3, surrounded at the base by a broad ring of hairy tomentum. Fruit ripening early in October, on slender drooping pedicels, in few-fruited clusters, obovate, rounded at the apex, gradually narrowed to the base, bright cherry red, lustrous, marked by small pale dots, about 1.2 cm. long and 1 cm. wide; calyx little enlarged, with a broad deep cavity and spreading appressed coarsely serrate lobes, their tips often deciduous from the ripe fruit; flesh thin, yellow, dry and mealy; nutlets 3, narrowed and rounded at the ends or acute at the apex, ridged on the back, with a broad high deeply grooved ridge, about 8 mm. long and 4–5 mm. wide.

A shrub 4–5 m. high, with numerous stout ascending many-branched stems covered with dark gray bark and forming a broad round-topped compact head, and slender, slightly zigzag branchlets marked by small oblong pale lenticels, dark orange-green when they

first appear, becoming bright chestnut-brown and very lustrous, in their first season, gray tinged with red the following year and ultimately ashy gray, and armed with slender straight or slightly curved bright chestnut-brown shining spines 3–4 cm. long.

Rocky pastures near Balance Rock, Lanesborough, Berkshire County, Massachusetts, *C. E. Faxon*, September 1899, *C. S. Sargent*, October, 1902, May 1904.

The relationship of this species is with the widely distributed *C. Holmesiana*, Ashe, from which it differs in its broad-ovate, not oval leaves, larger flowers and obovate later-ripening fruit.

ANOMALAE, Sarg. RHODORA, iii. 29 (1901).

Leaves cuneate, thickish to subcoriaceous, scabrate above while young; petioles slender, elongated. Flowers in many-flowered corymbs; anthers rose-colored or pink. Fruit short-oblong, orange-scarlet, 1–1.4 cm. in length; nutlets occasionally furnished with obscure ventral depressions. Mostly arborescent shrubs, all of western New England, eastern New York and the St. Lawrence valley near Montreal.

To this group, which is intermediate between the *Tomentosae* and the *Coccineae*, may be referred in addition to the following *C. asperifolia*, Sarg., *C. scabrida*, Sarg., *C. Brainerdi*, Sarg., and *C. Egglestoni*, Sarg.

Stamens 20.

Crataegus Seelyana, n. sp. Leaves obovate to oval, acuminate and often short-pointed at the apex, gradually narrowed and concave-cuneate at the entire base, finely doubly serrate above, with straight glandular teeth, and slightly divided above the middle into 4 or 5 pairs of short spreading acuminate lobes, when they unfold coated above with short white lustrous hairs and glabrous below, about half-grown when the flowers open at the end of May and then thin, yellow-green and slightly roughened above and pale below, and at maturity thick, glabrous, smooth and dark yellow-green on the upper, and pale or glaucous on the lower surface, 5–6.5 cm. long and 3.5–5 cm. wide, with stout yellow midribs, and slender veins extending obliquely to the points of the lobes; petioles slender, wing-margined at the apex, slightly grooved, glabrous, sparingly glandular, about 2 cm. in length; stipules linear, acuminate, glandular, bright rose color, caducous; leaves on vigorous shoots abruptly long-pointed, often rounded at the broad base, more deeply lobed, sometimes 6–7 cm. long and 4–5 cm. wide. Flowers 1.8 cm. in diameter, on slender

elongated glabrous pedicels, in usually 12–15-flowered corymbs, with linear-obovate to lanceolate glandular bracts and bractlets, bright rose color like the inner bud-scales and deciduous before the flowers open; calyx-tube narrowly obconic, glabrous, the lobes glandular-serrate usually only above the middle, or occasionally nearly entire, glabrous, reflexed after anthesis: stamens 20; anthers pale pink; styles 3, surrounded at the base by a narrow ring of pale tomentum. Fruit ripening at the end of September, on slender pedicels, in few-fruited clusters, short-oblong, lustrous, dull orange-red, about 1 cm. long and 7 cm. wide; calyx prominent, with a broad deep cavity, and appressed lobes mostly deciduous from the ripe fruit; flesh thin, yellow, dry and mealy; nutlets 3, rounded at the ends, slightly ridged on the back, with a broad low ridge, sometimes slightly hollow on the inner faces, 7–8 mm. long and 4–5 mm. wide.

An arborescent shrub 3–4 m. high, with ascending stems and stout nearly straight branchlets marked by small pale lenticels, deeply tinged with red and glabrous when they first appear, light chestnut-brown and very lustrous during their first winter and dark gray the following year, and armed with many stout nearly straight light chestnut-brown shining spines 2.5–5 cm. long.

Roadsides near Middlebury, Vermont, *Ezra Brainerd* (no. 6 A), May and September 1900, May 1901.

Formerly referred to *C. Brainerdi*, Sarg., but now distinguished from that species by the shape of the leaves, the color of the anthers the smaller fruits and by the more arborescent habit. It is named for Henry Martin Seely (1828–), for many years professor of chemistry and natural history in Middlebury College, teacher of botany and distinguished paleontologist.

Stamens 7–10.

Crataegus cyclophylla, n. sp. Leaves broadly ovate to suborbicular or rarely rhombic, short-pointed and acuminate at the apex, cuneate and entire at the base, sharply doubly serrate above, with straight or incurved glandular teeth, and slightly divided above the middle into 4 or 5 pairs of slender acuminate lobes, faintly tinged with red when they unfold, about half-grown when the flowers open the 1st of June and then thin, light yellow-green and somewhat roughened above by short white hairs and pale and glabrous below, and at maturity thick to subcoriaceous, dark yellow-green, lustrous, smooth or still slightly rough on the upper and pale on the lower surface, 5–6 cm. long and 4–5.5 cm. wide, with thick yellow midribs, and stout primary veins arching obliquely to the points of the lobes; petioles slender, slightly wing-margined at the apex, grooved on the upper

side, glabrous, glandular toward the apex, with minute deciduous glands, often rose color in the autumn, 2–2.5 cm. in length; stipules linear, acuminate, glandular, fading brown, caducous; leaves on vigorous shoots suborbicular to broad-obovate, coarsely serrate, only slightly lobed, subcoriaceous, often 6–7 cm. long and wide, with stout glandular petioles. Flowers 1.6–1.8 cm. in diameter, on slender glabrous pedicels, in compact usually 12–15-flowered corymbs, with linear glandular rose-colored bracts and bractlets; calyx-tube narrowly obconic, acuminate and red at the apex, glandular with minute dark red stipitate glands, reflexed after anthesis; stamens 7–10; anthers rose color; styles 3 or 4. Fruit ripening the end of September and persistent until winter, on slender reddish pedicels, in drooping few-fruited clusters, subglobose to short-oblong, orange-red, marked by small pale dots, 1.2–1.4 cm. long and about 1 cm. wide; calyx only slightly enlarged, with a wide deep cavity and spreading red lobes, their tips often deciduous from the ripe fruit; flesh thin, yellow, dry and mealy; nutlets 3 or 4, full and rounded at the ends, ridged on the back, with a high rounded ridge, 7–8 mm. long and 4–5 mm. wide.

An arborescent shrub 4–5 m. high, with ascending stems 5–7 cm. in diameter near the ground, and stout nearly straight branchlets marked by small oblong pale lenticels, light orange-green and glabrous when they first appear, light orange-brown and very lustrous during their first winter and dark gray-brown the following year, and armed with numerous stout nearly straight bright chestnut-brown and shining ultimately dull gray-brown spines 3–3.5 cm. long.

Roadsides, New Haven, Addison County, Vermont, *Ezra Brainerd* (no. 16a), June and September 1900, May 1901; *Brainerd* and *Sargent*, Sept. 1900.

The relationship of this species is with *C. Egglestoni*, Sarg., from which it differs in its much thicker semiorbicular leaves, larger flowers, glabrous corymbs and calyx-lobes, larger fruits and darker-colored nutlets, with dorsal ridges without grooves or only slightly grooved, and in the color of the branchlets and the length and color of the spines.

Crataegus Ideae, n. sp. Leaves, oval to ovate or obovate, short-pointed and acute at the apex, concave-cuneate and entire at the base, finely and occasionally doubly serrate above, with incurved conspicuously glandular teeth, and slightly divided above the middle into broad acute lobes, faintly tinged with red when they unfold, more than half grown when the flowers open at the end of May and then thin, light yellow-green and covered above by short white hairs and pale and glabrous below with the exception of a few axillary hairs, and at

maturity subcoriaceous, bright green, lustrous and sparingly hairy along the midribs on the upper and pale yellow-green and glabrous on the lower surface, 4–5 cm. long and 3.5–4 cm. wide, with stout yellow midribs rose-colored below toward the base, and slender prominent primary veins extending obliquely to the points of the lobes; petioles slender, narrowly wing-margined at the apex, grooved and villose on the upper side, glandular, with bright red mostly deciduous glands, rose-colored in the autumn, 1.5–2.5 cm. long; stipules oblong, acute, glandular, fading rose color, caducous; leaves on vigorous shoots broadly ovate, abruptly pointed or occasionally cuneate at the base, often 4 or 5 cm. long and 4 cm. wide. Flowers about 1.5 cm. in diameter, on elongated slender pedicels covered with long scattered white hairs, in wide lax many-flowered hairy corymbs, with oblong-obovate to linear bright rose-colored glandular bracts and bractlets mostly persistent until after the flowers have opened; calyx-tube narrowly obconic, glabrous or sparingly villose near the base, the lobes broad, gradually narrowed to the red glandular acuminate apex, obscurely serrate near the middle, glabrous on the outer, villose on the inner surface, reflexed after anthesis; stamens 10; anthers light pink; styles 3 or 4. Fruit ripening the middle of September, on stout slightly hairy erect red pedicels, in few-fruited clusters, short-oblong to subglobose, crimson, marked by large pale dots, about 1 cm. in diameter; calyx prominent, with a broad deep cavity and spreading lobes glandular-serrate above the middle, dark red and villose on the upper side, mostly persistent on the ripe fruit; flesh yellow, dry and mealy; nutlets 3 or 4, full and rounded at the ends, slightly ridged on the back, with a low narrow ridge, sometimes obscurely and irregularly pitted on the inner face, light-colored, about 7 mm. long and 4–5 mm. wide.

A tall much branched shrub forming wide thickets, with slender nearly straight branchlets marked by occasional large pale lenticels light yellow-green more or less tinged with red and nearly glabrous when they first appear, soon becoming bright chestnut-brown, dull reddish brown in their second and ashy gray in their third year, and armed with slender straight or slightly curved bright chestnut-brown shining spines 4.5–6 cm. long.

Hillside pastures at an altitude of about 500 metres, Concord, Essex County, Vermont; very abundant. *W. W. Eggleston* (nos. 3404, 3405 and 3405 A, type!), May and September 1903 and May 1905.

This species is named for Miss Mary Ellen Ide of the Fairbanks Botanical Museum, St. Johnsbury, Vermont.

COCCINEAE.

Stamens 10 or less.

Anthers white.

CRATAEGUS GRAVESII, Sarg. RHODORA, v. 160 (June 1903). An older name for this species is *C. Dodgei*, Ashe, *Jour. Elisha Mitchell Sci. Soc.* xix. 26 (March 1903). It is now known to range from Middlesex and Worcester Counties, Massachusetts (Shirley and Lancaster, *E. F. Thayer*) to western New York, and through Ontario to eastern Michigan, and to occur in eastern Pennsylvania.

Crataegus praetermissa, n. sp. Leaves broadly ovate to suborbicular or rarely oval, short-pointed and acuminate at the apex, broad, rounded or truncate or gradually narrowed and concave-cuneate at the glandular base, finely and often doubly serrate above, with straight gland-tipped teeth, and deeply divided into 4 or 5 pairs of slender acuminate lobes, more than half-grown when the flowers open the middle of May and then thin, yellow-green, lustrous and roughened above by short white hairs and paler and villose below especially along the midribs and veins, and at maturity thin but firm in texture, dark yellowish green, smooth and lustrous on the upper and pale and still villose on the lower surface along the slender yellow midribs, and thin veins arching obliquely to the points of the lobes, 5–6 cm. long and often as broad as long; petioles slender, slightly wing-margined at the apex, grooved on the upper side, glandular, with generally persistent glands, at first densely villose, becoming puberulous or nearly glabrous, 2–3 cm. in length. Flowers on short stout densely villose pedicels, in usually 5–7-flowered hairy corymbs; calyx-tube narrowly obconic, thickly coated with matted pale hairs, the lobes broad, acuminate, finely glandular-serrate, densely villose on the outer, sparingly villose on the inner surface, reflexed after anthesis; stamens 5–10; anthers white; styles 3 or 4. Fruit ripening about the middle of September and remaining on the branches until early in October, on long slender drooping sparingly hairy reddish pedicels, in few-fruited clusters, short-oblong to ovate, crimson, marked by small pale dots, hairy especially at the ends, 1–1.2 cm. long, 8–9 mm. in diameter, calyx little enlarged, with a wide deep cavity and spreading closely appressed villose lobes, their tips often deciduous from the ripe fruit; flesh thin, yellow, green, dry and mealy; nutlets 3 or usually 4, rounded at the base, gradually narrowed and rounded at the apex, only slightly ridged on the narrow back, about 7 mm. long and 4–5 mm. wide.

A shrub 2–3 m. high, with slender erect intricately branched stems, and very slender nearly straight branchlets marked by oblong pale lenticels, light green and thickly coated with matted pale hairs

when they first appear, soon glabrous and light bright chestnut-brown and very lustrous during their first year, becoming dull reddish brown the following season, and armed with slender straight chestnut-brown shining spines 3–5 cm. long.

Rocky borders of woods, eastern base of Marsh Hill, Ferrisburg, Addison County, Vermont, *Ezra Brainerd* (no. 17 b type!), August 1900, October 1901, 1903, *Brainerd and Sargent*, September 1905, *W. W. Eggleston* (no. 3338), May 1903.

Formerly referred to *C. coccinea*, Linnaeus, *C. praetermissa* differs from that species in its much thinner broader and more deeply lobed leaves and fewer-flowered corymbs, in its narrow pointed and only slightly ridged nutlets, and in its hairy fruit. It resembles *C. Faxoni*, Sarg., in the general shape of the leaves, but the leaves of *C. Faxoni* are much thicker, less deeply lobed and more hairy on the two surfaces while young, the pedicels are longer and soon glabrous, the fruit is larger, and the nutlets are longer, with more prominent dorsal ridges.

Anthers rose color or pink.

Crataegus propria, n. sp. Leaves ovate, acuminate, rounded or cuneate at the entire base, finely and often doubly serrate above, with incurved glandular teeth, and slightly divided above the middle into 4 or 5 pairs of broad acuminate spreading lobes, tinged with red when they unfold, about half grown when the flowers open the middle of May and then thin, yellow-green and covered above by short white lustrous hairs and pale and glabrous below, and at maturity thin and firm, glabrous, dark dull yellow-green on the upper, pale on the lower surface, 4–5 cm. long and 3–4 cm. wide, with slender yellow midribs sometimes tinged with red toward the base, and thin primary veins extending obliquely to the points of the lobes; petioles slender, wing-margined at the apex, slightly grooved, pubescent while young, soon becoming glabrous, glandular toward the apex, with minute dark stipitate glands; usually rose color in the autumn, 1.6–2 cm. in length; stipules linear, glandular, fading brown, caducous. Flowers on slender pedicels coated with matted pale hairs, in compact usually 9–12-flowered corymbs, with linear acuminate rose-colored bracts and bractlets; calyx-tube narrowly obconic, glabrous except at the base, the lobes slender, acuminate and red at the apex, glandular on the margins, glabrous on the outer, puberulous on the inner surface, reflexed after anthesis; stamens 5; anthers pale rose color; styles 2 or 3. Fruit ripening at the end of September and soon falling, on slender glabrous reddish pedicels, in small drooping few-fruited clusters, oblong, sometimes slightly ovate, full and rounded at the ends,

scarlet, lustrous, marked by small pale dots, 1–1.2 cm. long, 7–8 mm. wide; calyx prominent, with a narrow deep cavity, and reflexed closely appressed lobes pubescent on the upper side and often deciduous from the ripe fruit; flesh thick, orange color, becoming soft or succulent; nutlets usually 2, rounded at the ends or, when 3, acute at the apex, ridged on the back, with a high narrow ridge, about 7 mm. long and 5 mm. wide.

A shrub 3–5 m. high, with numerous stout ascending stems forming a broad round-topped head, and slender nearly straight branchlets marked by oblong pale lenticels, dark orange color and glabrous or slightly villose when they first appear, soon glabrous, bright chestnut-brown and lustrous during their first winter and dull gray-brown the following year, and armed with stout slightly curved bright chestnut-brown shining ultimately dull gray-brown spines 3–3.5 cm. long.

Low moist pastures, South Lancaster, Massachusetts, *E. F. Thayer* (no. 3, Parker Pasture, type!), September 1902, May and August 1903.

Crataegus Websteri, n. sp. Leaves oval, or sometimes oblong-obovate on vigorous shoots, acute or acuminate, gradually narrowed and concave-cuneate at the entire base, finely doubly serrate above, with straight glandular teeth, and slightly divided above the middle into 3 or 4 pairs of small spreading acuminate lobes, nearly fully grown when the flowers open late in May and then thin, light yellow-green and roughened above by short white hairs and pale and glabrous below with the exception of a few axillary hairs, and at maturity thin but firm in texture, dark yellow-green, nearly smooth on the upper and pale yellow-green on the lower surface, 5–6.5 cm. long and 3.5–4 cm. wide, with stout yellow midribs and slender conspicuous veins extending obliquely to the points of the lobes; petioles slender, slightly wing-margined at the apex, nearly terete, glandular, with minute stipitate mostly persistent glands, glabrous, 2–2.5 cm. in length. Flowers about 1.5 cm. in diameter, on long slender sparingly villose pedicels, in broad lax usually 8–14-flowered slightly hairy corymbs; calyx-tube narrowly obconic, slightly villose below the middle, glabrous above, the lobes gradually narrowed, acuminate, glandular serrate near the middle, glabrous on the outer and slightly hairy on the inner surface, reflexed after anthesis; stamens 7–10; anthers pale pink; styles 3, surrounded at the base by a narrow ring of white hairs. Fruit ripening the middle of September, on long drooping hairy pedicels, in few-fruited clusters, short-oblong, full and rounded at the ends, bright cherry red, lustrous, marked by large pale dots, 1–1.2 cm. long, 8–10 mm. wide; calyx enlarged, with a broad shallow cavity, and spreading slightly serrate lobes red and villose on the upper surface; flesh thin, yellow, dry and mealy; nutlets broad and rounded at the base, narrowed and rounded at the apex, ridged on the back, with a broad deeply grooved ridge, 6–7 mm. long and about 4 mm. wide.

An arborescent shrub 4–5 m. high, with a short trunk occasionally 15–18 cm. in diameter, spreading branches forming a wide open head, and stout zigzag branchlets marked by oblong pale lenticels, dark orange green and slightly hairy when they first appear, becoming pale chestnut brown and very lustrous, light reddish brown the following season, and ashy gray in their third year, and armed with very numerous slender nearly straight light chestnut-brown shining ultimately dull gray-brown spines 7–8 cm. long.

Hillsides, Holderness, Grafton County, New Hampshire, at elevations of from 250 to 300 m. above the sea, *L. S. Webster* (no. 6 type! and 5), May and September 1903.

This species is named for its discoverer, Mr. Laurence J. Webster of Holderness.

Crataegus Lemingtonensis, n. sp. Leaves broadly ovate, acuminate, rounded or cuneate at the broad base, finely often doubly serrate above, with slender straight glandular teeth, and divided into 4 or 5 pairs of short narrow acuminate spreading lobes, about half grown when the flowers open during the last week in May and then thin, light yellow-green and roughened above by short white hairs and pale and glabrous below, and at maturity thin, glabrous, yellow-green and smooth on the upper, paler on the lower surface, 4–5 cm. long and wide, with thin yellow midribs, and slender primary veins arching obliquely to the points of the lobes; petioles slender, slightly wing-margined at the apex, glabrous, glandular, with minute scattered persistent glands, 2–3 cm. in length; stipules linear, glandular, fading rose color, caducous; leaves on vigorous shoots often truncate or subcordate at the broad base, coarsely serrate, more deeply divided into broad acuminate lobes, often 6 cm. long and wide. Flowers about 1.2 cm. in diameter, on elongated slender villose pedicels, in compact mostly 7- or 8-flowered hairy corymbs; calyx tube narrowly obconic, coated with long matted pale hairs, the lobes slender, acuminate, slightly glandular-serrate, villose, reflexed after anthesis; stamens 10; anthers pink; styles 3 or 4, surrounded at the base by a narrow ring of pale tomentum. Fruit ripening about the 10th of September, on slender drooping slightly villose pedicels, in few-fruited clusters, short-oblong, full and rounded at the ends, scarlet, lustrous, marked by occasional pale dots; calyx prominent, with a wide shallow cavity, and spreading or closely appressed lobes covered above with long white hairs, mostly persistent on the ripe fruit; flesh thick, yellow, soft and succulent; nutlets usually 3, gradually narrowed and rounded at the ends, ridged on the back, with a broad deeply grooved ridge, 6–7 mm. long and 4–5 mm. wide.

An arborescent shrub 4–5 m. high, with numerous ascending stems spreading into great thickets, and stout zigzag branchlets marked by

oblong pale lenticels, pale yellow-green and glabrous when they first appear, dull chestnut-brown during their first and light gray-brown in their second year, and armed with stout slightly curved chestnut-brown shining spines 4–5 cm. long and often pointed toward the base of the branch.

Hillsides, Essex County, Vermont; common; Lemington, Canaan, Bloomfield, *W. W. Eggleston* (no. 3408 type! Lemington); also the adjacent parts of New Hampshire.

Stamens 20; anthers pink.

Crataegus insolens, n. sp. Leaves oblong-ovate, acute or acuminate, gradually or abruptly cuneate or rounded at the base, finely often doubly serrate, with straight or incurved teeth tipped with bright red glands, and sharply and slightly divided into 4 or 5 pairs of slender acuminate lobes, deeply tinged with red and covered above when they unfold with soft white hairs and glabrous below, more than half grown when the flowers open during the last week of May and then thin but firm in texture, pale yellow-green, still hairy and slightly roughened above and pale or glaucous below, and at maturity thin, dark green and nearly smooth on the upper and pale yellow-green on the lower surface, 4–5 cm. long and 3–3.5 cm. wide, and on vigorous shoots 6–7 cm. long and 5–6 cm. wide, with slender yellow midribs, and thin primary veins extending obliquely to the points of the lobes; petioles slender, wing-margined at the apex, slightly grooved, glandular near the apex, with minute mostly early deciduous glands, glabrous, 2.5–3 cm. in length. Flowers on long slender slightly villose pedicels, in usually 7–10-flowered hairy corymbs, the lower peduncles from the axils of upper leaves, their bracts and bractlets linear, glandular, fading brown, caducous; calyx-tube narrowly obconic, glabrous, or villose at the base, the lobes gradually narrowed from wide bases, acuminate, irregularly glandular-dentate near the middle, glabrous on the outer, sparingly villose on the inner surface, reflexed after anthesis; stamens 20; anthers small, pink; styles 3–5. Fruit ripening the middle of September, on erect reddish pedicels, in 1–3-fruited clusters, short-oblong, rounded at the ends, scarlet, lustrous, 1–1.2 cm. long and 8–10 mm. wide; calyx little enlarged, with a broad shallow cavity, and spreading and reflexed lobes, their tips often deciduous from the ripe fruit; flesh thin, yellow-green, dry and hard; nutlets 3–5, rounded at the obtuse ends, or when more than 3 narrowed at the ends and acute at the apex, ridged on the back with a broad often deeply grooved ridge, about 7 mm. long and 4 mm. wide.

A shrub 3–4 m. high, with numerous stems spreading into broad thickets, and slender nearly straight branchlets marked by oblong

pale lenticels, orange-green more or less tinged with red and slightly hairy, with scattered pale hairs, when they first appear, soon glabrous, bright chestnut-brown and very lustrous during their first season and light reddish brown the following year, and armed with numerous straight or slightly curved bright chestnut-brown shining spines 3.5–5 cm. long.

Hillsides, West Concord, Essex County, Vermont, *W. W. Eggleston* (no. 3403 type!), May and September 1903.

Crataegus Blanchardi, n. sp. Leaves ovate, short-pointed and acuminate at the apex, abruptly or gradually narrowed and cuneate at the entire base, finely often doubly serrate above, with straight glandular teeth, and divided into 4 or 5 pairs of narrow acuminate lateral lobes, when they unfold bronze color, glandular at the base, and covered with long white hairs more abundant on the upper than on the lower surface, nearly half grown when the flowers open about the 20th of May and then thin, yellow-green above and paler and sparingly villose below along the midribs and veins, and at maturity subcoriaceous, dark green and lustrous on the upper and pale yellow-green and almost glabrous on the lower surface, 4.5–6 cm. long and 4.5–5 cm. wide, with stout yellow midribs and slender veins arching obliquely to the points of the lobes; petioles slender, wing-margined at the apex, slightly grooved, at first villose, becoming glabrous, and glandular, with minute mostly caducous glands; stipules linear, glandular, fading brown, caducous; leaves on vigorous shoots rounded or truncate at the base, coarsely serrate, deeply lobed, 6–7 cm. long and wide, with stout broadly winged petioles glandular through the season. Flowers 1.5–1.7 cm. in diameter, on long stout densely villose pedicels, in thick-branched hairy corymbs, with oblong to linear obovate glandular bracts and bractlets often persistent until the flowers open; calyx-tube broadly obconic, covered below with long matted pale hairs and glabrous above, the lobes gradually narrowed from wide bases, short, acuminate, glandular-serrate near the middle, glabrous on the outer, slightly villose on the inner surface, reflexed after anthesis; stamens 20; anthers pale pink, styles 3–5, surrounded at the base by a narrow ring of pale hairs. Fruit ripening at the end of September, on thick erect slightly villose pedicels, in few often 3–6-fruited clusters, short-oblong, full and rounded at the ends, dark cherry red, lustrous, marked by small pale dots; calyx little enlarged, with a wide shallow cavity, and spreading and appressed serrate lobes villose on the upper side and often deciduous from the ripe fruit; flesh thick, yellow, soft and pulpy; nutlets 3–5, rounded at the base, acute at the apex, ridged on the back, usually with a high narrow slightly grooved ridge, or when only 3 full and rounded at the ends, with a broad deeply grooved ridge, 6–7 mm. long and about 4 mm. wide.

A shrub 3–4 m. high, with numerous stems spreading into thickets,

and slender nearly straight branchlets marked by pale lenticels, dark orange-green when they first appear, light chestnut-brown and lustrous in their first winter, lighter-colored in their second season, and light gray-brown the following year, and armed with many stout slightly curved bright chestnut-brown shining ultimately dark gray-brown spines 4–5 cm. long.

Hillsides, Deerfield River Valley, Windham County, Vermont; common. Wilmington and Whitington, *W. H. Blanchard* (no. 7), August 1902, *W. W. Eggleston* (nos. 3451, 3452 type! and nos. 3446, 3449, 3453), May and September 1903.

This species is named for William Henry Blanchard, an industrious and critical student of Crataegus and Rubus, and the discoverer of other interesting New England plants.

Intricatae.

Crataegus Peckii, Sarg., Rhodora, v. 63, (1903). A specimen gathered at Great Barrington, Massachusetts, by *Brainerd* and *Sargent* on October 4, 1902, was doubtfully referred by me in Rhodora to this species. The flowers subsequently gathered by Mr. Eggleston showed that the Great Barrington shrub is *C. Baxteri*, Sarg., a common species in the neighborhood of Albany, New York, and in western New York and eastern Pennsylvania. *C. Baxteri* was published in June 1903 in the *Proceedings of the Rochester Academy of Science* (iv. 107) but the Pennsylvania plant had been published by Ashe as *C. foetida* in *Ann. Carnegie Museum* (i. pt. iii. 389) in May 1902, and his name must supercede *C. Baxteri.*

Arnold Arboretum.

A NEW RANUNCULUS FROM NORTHEASTERN AMERICA.

B. L. Robinson.

About a year ago the writer in examining some of the *Ranunculi* of the *pedatifidus-pygmaeus* affinity noticed that a plant from Labrador and Gaspé Peninsula of Quebec, which has been passing as

the arctic *R. pedatifidus* J. E. Smith, is in reality quite distinct from that species. The basal leaves are merely crenate as in *R. abortivus* L. and not deeply cleft as in *R. pedatifidus*. The smaller flowers and glabrous achenes furnish also clear characters for the separation of the northeastern plant. An attempt to place more satisfactorily this little buttercup led at that time to the view that it was a tall variety of the arctic *R. pygmaeus* Wahl.

During the past summer, however, Messrs. Fernald & Collins in their exploration of Gaspé Peninsula succeeded in securing an abundance of fruiting and some flowering material both of the typical *R. pygmaeus* and of the doubtful plant. From their field observations they were convinced that the two were entirely distinct, and they have kindly referred their specimens to the writer for further study. The doubtful plant, as shown by the excellent material now at hand, proves in fact readily distinguishable both from *R. pedatifidus* and from *R. pygmaeus*, differing from the latter not merely by greater stature and more erect habit but by having much larger achenes. The species is dedicated with pleasure to Mr. John Alpheus Allen, who early collected it on Mt. Albert, Gaspé. It may be characterized as follows: —

Ranunculus Allenii, nov. spec. Herba perennis terrestris parva erecta caulescens 1.2–2 dm. alta; radice e fibris gracilibus plurimis composita; caule solitario simplici vel semel ramoso erecto gracili leviter villoso recto vel plus minusve flexuoso viridi 2–4-foliato; foliis radicalibus ca. 4 longe petiolatis orbicularibus vel subreniformibus 8–20 mm. longis 15–30 mm. latis profunde 7–11-crenatis ciliatis utrinque viridibus subtus vix pallidioribus, petiolis gracilibus villosis 3–7 cm. longis; foliis caulinis in lobos ellipticos vel lanceolati-oblongos fere ad basin 3–5-sectis, petiolis brevibus; foliis supremis subsessilibus saepissime integris lanceolatis vel 2–3-partitis; pedunculis villosis 1–6 cm. longis; sepalis 5 ovatis obtusis subpetaloideis luteo-vel viridi-purpurascentibus venosis pallide villosis concavis 3 mm. longis patentibus vel plus minusve reflexis; petalis 5 laete flavis obovato-suborbicularibus integris 5 mm. longis 3–3.5 mm. latis, nectariis saturate flavis obtriangularibus truncatis vel levissime retusis; staminibus 12–20, filamentis clavellatis glabris; stylis filiformibus recurvatis, parte basali in rostro parvo uncinato persistente; achaeniis semiobovatis leviter compressis viridibus glabris 1.8 mm. longis; receptaculo ovoideo-cylindrico patente villoso.

Herbaceous, perennial, terrestrial, small, erect, caulescent, 1.2 to 2 dm. high: root a fascicle of slender fibers; stem solitary, simple or once branched, slender, slightly villous, straight or somewhat flexuous, green, 2–4-leaved: basal leaves about 4, long-petioled;

limb orbicular or somewhat reniform 8 to 20 mm. long, 15 to 20 mm. wide, deeply 7–11-crenate, ciliate, green on both surfaces, scarcely paler beneath; petioles slender 3 to 7 cm. long; cauline leaves cleft almost to the base into 3 to 5 elliptical or lanceolate-oblong lobes; their petioles short; the uppermost leaves subsessile, entire and lanceolate or 2–3-parted: peduncles villous, 1 to 6 cm. long: sepals 5, ovate, obtuse, somewhat petal-like yellowish or greenish purple, veiny, pale, villous, concave, 3 mm. long, spreading or slightly reflexed: petals 5, bright yellow obovate-suborbicular, entire, 5 mm. long, 3 to 3.5 mm. wide; nectaries deep yellow, reversed triangular, truncate or retuse: stamens 12 to 20; filaments clavellate, glabrous: styles filiform, recurved, the basal part persistent as a short hooked beak; achenes semi-obovate, slightly compressed, green, glabrous, 1.8 mm. long: receptacle ovoid-cylindrical, spreading-villous.

GASPÉ COUNTY, QUEBEC: on flood plain of an alpine brook, north face of Mt. Albert, alt. 770 to 1100 m., 14 August, 1905, *J. F. Collins & M. L. Fernald*, no. 83 (type, in herb. Gray); by a rivulet on the side of Mt. Albert, alt. 550 m., 23 July, 1881, *J. A. Allen.* LABRADOR: Okkak, collected by the Moravian Brothers, the specimen confused with plants of *R. pygmaeus* Wahl.; Rama, 20–24 August, 1897, *J. D. Sornborger*, no. 189.

So far as traced by the writer the plant, here described as *R. Allenii*, has been in the past treated as follows: —

R. affinis var. *leiocarpus* J. Macoun, Cat. Pl. Canad. 18 (1883).

R. affinis Robinson in Gray, Syn. Fl. i. pt. 1, 31, in foot-note (1895), not R. Br.

R. pedatifidus Britton & Brown, Ill. Fl. ii. 77 (1897), as to plant of Quebec and Labrador, as to most of the characters given, and as to the habital sketch, but not, however, as to the achene figured, which from its pubescence is presumably that of *R. pedatifidus* J. E. Smith.

By the distinctions already given *R. Allenii* can be readily separated from *R. pedatifidus* and from the typical form of *R. affinis.* Regarding *R. affinis*, var. *leiocarpus* Trautv., the difficulty is greater, owing to the extremely meager and unsatisfactory description of the Siberian plants. Trautvetter distinguishes his variety solely on its smooth achenes and in this character it would accord well enough with the plant of northeastern America, but he further divides the variety into two forms, the first with petals twice longer than the suborbicular sepals and the second with petals somewhat shorter than the oblong-elliptical sepals. Neither of these brief character-

izations fits satisfactorily the American plant, which has as we have seen, ovate sepals about two-thirds the length of the petals. It is more than probable that the elements included by Trautvetter in his var. *leiocarpus* were quite different from each other, if not specifically distinct. When to this fact is added his vague and fragmentary characterization and the great geographic distance of the Siberian station, the treatment of the American plant as a separate species seems to be fully justified.

R. Allenii possesses a curious and interesting habital resemblance to the plant of southern Missouri and adjacent Arkansas, which was described as *R. abortivus*, var. *Harveyi* Gray, Proc. Am. Acad. xxi. 372 (1886), and which has since been raised to specific rank by Dr. Britton. The northeastern plant has, however, a decidedly lower stature and rounder petals. The marked difference of geographic range and habitat would furthermore render specific identity extremely improbable.

Gray Herbarium.

PHYCOLOGICAL NOTES OF THE LATE ISAAC HOLDEN, — II.

Edited by F. S. Collins.

(*Continued from p. 172.*)

Lyngbya subtilis Holden. 774, 779. Seaside Park. Dec. "This appears to have filaments attached at the middle. Can find no terminal hairs. Has it any chroococcoid stratum except the *Pleurocapsa* with which it is associated and upon which it appears to be epiphytic? Escaped hormogonia U-shaped. Branching?."

L. lutea (Ag.) Gomont. 939, 1060, 1473, 1501, 1507. On woodwork between tide marks, below Yellow Mill Bridge; on turfy bottom at Seaside Park; among *L. aestuarii* (Mert.) Liebm., Cook's Point; on sandy mud, Charles Island. May–July, Oct.

Symploca hydnoides Kütz. 862. With other minute algae in Yellow Mill Pond. Aug.

Plectonema terebrans Born. & Flah. 861, 869. In marine shells with other algae, Harbor. Sept., Oct.

Hydrocoleum glutinosum (Ag.) Gomont. 664 = P. B.–A. 453, 1033. On iron piles, Black Rock Beacon. July, Aug.

H. Holdenii Tilden. 1194, 1195, 1326, 1367 = P. B.–A. 602, 1464. "Forming a gelatinous tubular coating around old stems of Spartina in a brackish ditch." Cook's Point. May, Sept.

Microcoleus chthonoplastes (Fl. Dan.) Thuret. 881, 1508. Seaside Park, forming a thick coating on turf near high water mark; Cook's Point, in sheets, on sandy bottom between tide marks. Sept., Oct.

Anabaena torulosa (Carm.) Lagerh. 339, 1119. On mud on margin of marsh pools, Cook's Point; on muddy sand, near high water mark, among *Spartina*, shore of The Gut. June.

A. variabilis Kütz. 704, 709. With *Oscillatoria princeps* Vauch, etc., Fresh Pond. Aug.

Nodularia spumigena var. *major* (Kütz.) Born. & Flah. 1458, 1459, 1460, 1461. Marsh pool, Cook's Point, filaments scattered among *Lyngbya*, *Hydrocoleum*, etc., May 14. "No spores observed." May 20. "No spores yet." May 28. "Spores have appeared, proving var. γ *major* Bornet & Flahault."

Microchaete grisea Thuret. 765. On stranded stump, Seaside Park. Nov.

Mastigocoleus testarum Lagerh. 709½, 861. In shells, Fresh Pond. Aug., Sept.

Amphithrix violacea (Kütz.) Born. & Flah. 756. On stones, Fresh Pond. Nov.

Calothrix aeruginea (Kütz.) Thuret. 732½, 1034. Forming a coating with *Enteromorpha sp.* on iron piles between tide marks, Black Rock Beacon. Aug., Oct.

C. confervicola (Roth) Ag. 703. On *Ruppia*, Fresh Pond. Aug.

C. crustacea Thuret. 155, 482, 483, 636 = P. B.–A. 10, 641, 714, 724. On algae and rocks, Stratford Shoals; Woodmont; Cook's Point. July, Sept., Oct.

C. parasitica (Chauvin) Thuret. 1127a. On *Nemalion multifidum*, Stratford Shoals. July.

C. pulvinata (Mert.) Ag. 147, 487, 967. On woodwork at or above high water mark, Black Rock; Stratford Shoals; on old hulk, Cook's Point. Aug., Oct.

C. scopulorum (Web. & Mohr) Ag. 153, 1128. On rocks, Stratford Shoals. July, Sept.

Rivularia atra Roth. 1220 = P. B.–A. 357b. On turf of *Spartina*, Charles Island. Sept.

R. nitida Ag. 651, 685, 728. On bank of outlet, Fresh Pond. July–Sept.

Isactis plana (Harv.) Thuret. 439, 726. On stones, Charles Island. Sept.

Monostroma crepidinum Farlow. 761, 763, 772, 1066. Seaside Park, on rocks; outlet of Fresh Pond. Nov., Dec.

M. Grevillei (Thuret) Wittr. 268, 279, 557, 794, 797, 801. Seaside Park; Cook's Point. March, Apr.

M. latissimum (Kütz.) Wittr. 14, 18, 310, 321, 333, 1244, 1353, 1356, 1456. Fresh Pond, on *Zostera*, *Ruppia*, etc. "Fronds of all sizes up to nearly 2 ft. long, some over a foot wide, some small ones looking like *M. pulchrum*." Cook's Point; Yellow Mill Pond. Apr., May.

Ulva Lactuca var. *rigida* (Ag.) Le Jolis. 1339, 1349 = P. B.–A. 407. On stones in pools and between tides, Seaside Park. Nov.

U. Lactuca var. *mesenteriformis* (Roth) Collins. 1354, 1355. Washed ashore, Yellow Mill Pond. Apr.

Enteromorpha clathrata (Roth) J. Ag. 1269. Fresh Pond. June.

E. crinita (Roth) J. Ag. X5, X10, X11. On turf near high water mark, Seaside Park; Fresh Pond.

E. erecta (Lyng.) J. Ag. 612. On *Fucus*, Woodmont. June.

E. Hopkirkii McCalla. 692, 719, 804, 806 = P. B.–A. 463. On *Zostera*, Milford Point; Fresh Pond. Apr., Sept. "At Fresh Pond in April this grew to the length of 2 or 3 feet in a week, forming long, ropy, confervoid strings, attached at base to pebbles (and shells) and floating on the surface. The long, monosiphonous branches and elongated tips, when fresh, float in the air like spider's webs."

E. intestinalis (L.) Link. 282, 311, 336, 950. Fresh Pond; Yellow Mill Pond. Mar.–June.

E. intestinalis forma *cylindracea* J. Ag. X7, X9, 1257. Seaside Park; Yellow Mill Pond. May.

E. Linza (L.) J. Ag. 316, 330, 821, 1359. Seaside Park. Apr., May.

E. Linza var. *crispata* J. Ag. X1. Brackish pond in Seaside Park. Apr.

E. minima Näg. 782, 808, X3, X8, 1245, 1255 = P. B.–A. 468, 1256, 1261. On stones and mussels near high water mark, below Yellow Mill Bridge; Seaside Park. Feb., May.

E. percursa (Ag.) J. Ag. 1260. Cook's Point, among other algae. May.

E. prolifera J. Ag. 823, 829, 1254 = P. B.–A. 470, 1258, 1264. Yellow Mill Pond, "Some specimens 6 or 7 feet long"; Seaside Park, on stones and shells; Fresh Pond, attached to firm sandy bottom and *Spartina* turf between tide marks; Cook's Point. May.

Ilea fulvescens (Ag.) J. Ag. 33, 379, 687, 767, 755, 777, 1196. On rocks between tides, Seaside Park; on timber at shipyard, Cook's Point; Fresh Pond; Long Beach. May, June, Oct.–Dec.

Protoderma marinum Reinke. 1483a. Seaside Park. Jan.

Ulothrix flacca (Dillw.) Thuret. 558, 912, 915, 1077, 1079. With *U. implexa*, on rocks not far from high water, Woodmont; on *Fucus*, Seaside Park. Mar., Apr.

U. implexa Kütz. 558, 792, 793, 799, 810 = P. B.–A., 115a, 815, 1172. Woodmont, with *U. flacca*; on stones and *Spartina*, Yellow Mill Pond; in brackish pond, Seaside Park. Dec., Apr., May.

Stichococcus marinus (Wille) Hazen. (*Ulothrix variabilis* var. *marina* Wille.) 1093. Ash Creek, near Black Rock, on bank overflowed at high water. Apr.

Epicladia Flustrae Reinke. 610, 691, 864. On polyzoon on back and legs of spider crab. June, Aug.

Hormiscia penicilliformis (Roth) Fries. (*Urospora penicilliformis* Aresch.) 232, 240, 256, 280, 309, 543, 555. On rocks and woodwork, near high water mark, Seaside Park; Cook's Point. Jan.–Apr., Dec.

Chaetomorpha aerea (Dillw.) Kütz. 27. On pebbles, Long Beach. June.

C. Linum (Fl. Dan.) Kütz. 688 = P. B.–A. 22, 1432. Long Beach, near Stratford Point; Salt marsh pool, Cook's Point. Aug., Oct.

Rhizoclonium riparium (Roth) Harv. 151. On rocks between tides, Stratford Shoals. Sept.

R. tortuosum Kütz. 1235, 1236. Forming a fleece on *Sphacelaria radicans*, etc., Seaside Park. Dec.

R. tortuosum forma *polyrhizum* Holden. 1266 = P. B.–A. 625. On firm bottom and on other algae, Cook's Point. June.

Cladophora albida (Huds.) Kütz. 34, 609. On stones near low water mark, Seaside Park. June.

C. albida var. *refracta* Thuret. 943, 1129, 1546. Cook's Point; Stratford Shoal; The Gut. May–July.

C. arcta (Dillw.) Kütz. 245, 266, 298, 308, 314, 785, 914, 1074. Seaside Park. Jan., Mar.–May..

C. expansa (Mert.) Kütz. 796, 830 = P. B.–A. 121. Brackish pond, Cook's Point. Apr., May. "Lives through the winter."

C. expansa forma *glomerata* Thuret. 1536. Fresh Pond. Aug.

C. gracilis (Griff.) Kütz. 46, 351, 356, 364, 848, 1374. Cook's Point, in muddy pools; Woodmont; Charles Island. June, July.

C. lanosa (Roth) Kütz. 1498. Charles Island, floating. May.

C. lanosa var. *uncialis* (Harv.) Thuret. 37. Stratford Shoal. June.

C. Magdalenae Harv. 1440. Charles Island. Nov. "Forming felty mats or turfs on sandy mud, among *Spartina*, near high water mark. Same grows on shore of Seaside Park. A cold weather plant, appearing in late autumn (as far as I know)." "Dec. 25. Cladophora No. 1440 was fairly abundant at this time."

C. Rudolphiana (Ag.) Harv. 12, 19, 148, 322, 331, 594. Fresh Pond, abundant on stones, *Ruppia*, etc. May, Sept.

Gomontia polyrhiza (Lagerh.) Bornet & Flahault. 861. In dead shells, Bridgeport harbor. Aug.

Bryopsis plumosa (Huds.) Ag. 57, 383, 624, 649, 675, 847, 1373. Penfield Reef; Breakwater; Seaside Park; Woodmont; Pool about high water mark, Charles Island. June–Aug.

Vaucheria litorea Ag. 1173, 1177, 1351. Abundant in very brackish pond, Seaside Park. Apr., Dec.

V. piloboloides Thuret. 663, 722, 1200. On muddy rocks below low water, Black Rock Beacon, July; "On shelly sand bottom near westerly extremity of sand bar running into harbor from near Pleasure Beach House, Alcazar, just below ordinary low water mark, in abundant tufts over several square rods." Sept.

Pylaiella littoralis (L.) Kjellm. 1447. Cook's Point. Unilocular sporangia, Apr.

Ectocarpus aecidioides Rosenv. 1497. On tips of *Laminaria Agardhii*, Charles Island. May.

E. amphibius Harv.? 332. On *Zostera*, and *Ruppia* Fresh Pond. May.

E. confervoides (Roth) LeJolis. 534, 539, 762, 765. Seaside Park, on *Fucus*, etc. Dec. "No. 762 on stranded stump; cells in largest filaments 20–30 μ, as long as wide; in ultimate branches about 12 μ, several times longer than wide. Plurilocular sporangia 18–30 μ wide, 75–125 μ long; branching alternate."

E. confervoides forma *brumalis* Holden. 542, 548, 1442 = P. B.–A. 576. On *Spartina*, stubble, etc., between tides, nearer high water mark, Seaside Park and Charles Island. Dec., Jan. "Extreme breadth of cells about 25 μ; plurilocular sporangia of various lengths up to 150 μ or more, and in width up to 25 μ; fronds mostly one or two cm. in height. I have never seen this form except in winter, mostly about Xmas time."

E. reptans Crouan? 650. On *Zostera*, Black Rock. July.

E. siliculosus (Dillw.) Ag. 1032, 1262, 1341. Black Rock Beacon; Fresh Pond; Cook's Point. May, Aug., Nov.

E. subcorymbosus Farlow.[1] 703, 720, 1230, 1340 = P. B.–A. 415. On *Ruppia*, with *Enteromorpha*, etc., Fresh Pond; in muddy pools, Cook's Point. Aug.–Nov. "About 1 mm. high; cells about 12 μ or a little more in diameter, 2–4 times as long. Branching alternate or opposite. When opposite the main filament often prolonged into a very long hyaline hair from the point of branching. Such a hair also frequently taking the place of a branch or forming the prolongation of an ordinary filament or branch. Plurilocular sporangia 18–25 μ wide, 60–100 μ long, terminal or lateral, the latter generally with a short stipe of 1–3 cells. Filaments much crowded at base, where they (and also hairs) spring from an almost parenchymatous mass."

Ascocyclus orbicularis (J. Ag.) Magnus. 874, 1521. On *Zostera* Yellow Mill Pond; Pleasure Beach. July, Sept.

Sphacelaria radicans (Dillw.) Ag. 149, 177, 880. Stratford Shoal, on rocks between tides; Seaside Park, on turfy bottom. Sept.–Nov.

S. cirrhosa (Roth) Ag. 510, 535. Seaside Park, on *Fucus* and *Polysiphonia*. Nov., Dec.

Desmotrichum undulatum (J. Ag.) Reinke. 575, 1100, 1104, 1252. Seaside Park, on *Zostera*, with *Halothrix*. Apr., May. Plurilocular sporangia, May.

D. Balticum Kütz. With *D. undulatum*, Seaside Park, with plurilocular sporangia, May.

Punctaria latifolia Grev. 812, 930, 931 = P. B.–A. 82, 936, 1111, 1192, 1248, 1250. Cook's Point; Seaside Park; on shells and *Zostera*. Apr., May.

[1] This quite distinct species has long been in the unsatisfactory position of a species distributed under a manuscript name but never published. Mr. Holden's excellent description may well be used to place it on a more stable basis.— F. S. C.

P. plantaginea (Roth) Grev. 817, 922, 928, 935 = P. B.–A. 81, 1073, 1089, 1105, 1237, 1247. Seaside Park, on stones and *Fucus*, just below low water. Apr., May.

Scytosiphon lomentarius (Lyng.) J. Ag. 819, 918, 1072, 1088, 1246 = P. B.–A. 323a. Seaside Park, on stones. Apr., May.

S. lomentarius forma *complanatus* Rosenv. 917, 1080, 1085, 1087 = P. B.–A. 174, 1176, 1178, 1238, 1243, 1489, 1509. Seaside Park, on *Zostera*. Mar., Apr. "May 5, The narrow compressed *Scytosiphon* (1087, 1095, etc.) becoming passé. Occasional old fronds of it floating on the surface, inflated."

Phyllitis fascia (Fl. Dan.) Kütz. 230, 537, 546, 547, 758, 802, 813, 929, 1068, 1090, 1272, 1344. Seaside Park; Cook's Point; on stones, mussels, and *Spartina* stumps. Nov.–June.

P. fascia var. *caespitosa* (Ag.) Farlow. 293, 294, 302, 305, 896. With the type. Apr., Nov.

Asperococcus echinatus (Mert.) Grev. 1253. Diminutive form growing on *Zostera* with *Desmotrichum*, *Halothrix*, etc. Seaside Park. May.

Stictyosiphon subsimplex Holden. 1342, 1365, 1366, 1368, 1462, 1465 = P. B.–A. 630. Cook's Point, in muddy marshy pools. Nov., May, June. "Noted fronds of lengths up to 5½ inches."

Desmarestia aculeata (L.) Lamour. 1491. Seaside Park. Apr.

D. viridis (Fl. Dan.) Lamour. 295, 299, 306, 313, 323, 568, 573, 783, 911, 916, 921, 923, 926, 927, 1084, 1094, 1098, 1179, 1180, 1239, 1240, 1350, 1362, 1484. Seaside Park. March–May.

Dictyosiphon fœniculaceus var. *Americanus* Collins. 304, 312, 814, 820, 937, 1114, 1496, 1506. On *Phyllitis* and *Scytosiphon*; Cook's Point, in marsh pools; Seaside Park; Black Rock. Apr.–June.

Elachista fucicola (Velley) Fries. 38, 586. Stratford Shoal; Seaside Park. May, June.

Halothrix lumbricalis (Kütz.) Reinke. 315, 328, 533, 569, 587, 1096, 1103, 1251. Seaside Park, on *Zostera*. Dec., Apr., May.

Castagnea virescens (Carm.) Thuret. 1101. On *Zostera*, Seaside Park. May.

Myriactis pulvinata var. *minor* Farlow. 865. On *Sargassum*, Seaside Park. Aug. "Apparently rather young. Only plurilocular sporangia; filaments up to 25 μ broad, but generally 10–18 μ."

Leathesia difformis (L.) Aresch. 320, 327, 1112, 1116, 1502. On *Zostera*, Seaside Park; Cook's Point; Charles Island. May.

Mesogloia divaricata (Ag.) Kütz. 846, 867, 1143. Woodmont, on *Chondrus*; Seaside Park; Long Beach. July, Aug.

Chordaria flagelliformis (Fl. Dan.) Ag. 382, 422, 1106, 1113. On stones below low water, Long Beach; on *Zostera*, young, Seaside Park. May–Aug.

Stilophora rhizodes (Ehrh.) J. Ag. 419. 420, 644, 693, 1407. Attached to pebbles on sandy flats about low water mark or a little below; Long Beach; Black Rock; Milford; Charles Island. July, Aug.

S. rhizodes forma *contorta* Holden. 627, 1263, 1270. Fresh Pond. May, July. "Fronds contorted and entangled in dense bunches on stones in shallow water, about one foot deep."

Ralfsia Borneti Kuckuck. 1483b. Seaside Park. Jan.

R. clavata (Carm.) Farlow. 1510. On stones in pools, Charles Island. Apr.

R. verrucosa (Aresch.) J. Ag. 444, 484, 593, 678, 1224=P. B.-A. 325b.

Chorda Filum (L.) Stack. 647. Black Rock, young. July.

Laminaria Agardhii Kjellm. (*L. saccharina*, in part.) 489, 780, 1041, 1369, 1377, 1443, 1445, 1448, 1449, 1487, 1490, 1492, 1493, 1504, 1544, 1549, 1553. Washed ashore, Seaside Park; The Gut; Black Rock; Charles Island; Pleasure Beach; dredged, Stratford Shoal. Jan., Mar.–June, Oct. Fruit, Oct. "1449, Apr. 22, Old and new blade."

L. Agardhii forma *vittata* Setchell. 1467. Black Rock Beacon. June. "1518. June 30. Dredged from a depth of 2 or 3 fathoms at low water."

Fucus evanescens Ag. 297, 303, 592, 789, 805. 1078, 1086, 1091, 1370, 1488. Seaside Park; Woodmont; Apr.–June.

F. platycarpus Thuret. 157, 480, 490, 1380. Rocks about low water mark, Stratford Shoal; Woodmont; Cook's Point. June, Sept. Oct.

F. platycarpus forma. 1423, 1537. Woodmont. Sept. A form intermediate between the typical one and *F. Areschougii* Kjellman.

F. vesiculosus L. 1115, 1118, 1371. Long Beach; Seaside Park. June.

F. vesiculosus var. *spiralis* (L.) Ag. 1378, 1379=P. B.-A. 680. Chippy Island, near The Gut. June. "Growing unattached, in tangled bunches, along with *Ascophyllum Mackaii*, the latter in dense

beds, finely dissected, sterile. On grassy bottom above limit of ordinary high water, rarely producing little vesicles and attempts at fruiting. A beautiful plant when growing. It has very much the habit of *Ascophyllum Mackaii* and seems to bear the same relation to typical *F. vesiculosus* as *A. Mackaii* does to *A. nodosum*."

F. vesiculosus var. *sphaerocarpus* Farlow. 1372. Cook's Point. June.

F. vesiculosus var. *laterifructus* Grev. 679, 715, 764. Woodmont. Aug., Sept., Nov. "Resembles *F. ceranoides*."

F. vesiculosus forma? 1363, 1364. Cook's Point, on mussels near high water mark, in thick beds. "When young this appears to be a good var. *spiralis*; older it develops oftentimes abnormal vesicles; rarely fruiting." May.

Ascophyllum Mackaii (Turn.) Holmes & Batters. 281, 305a, 1082, 1097 = P. B.-A. 177. Mar.-May.

A. nodosum (L.) LeJolis. 800, 1455, 1457 = P. B.-A. XV. Seaside Park; Fairweather Island. Apr., May. "No. 800, hermaphrodite, young oogonia in same conceptacles with antheridia; oogonia comparatively few, on the same branched hairs as the antheridia; also sometimes arising in the regular way from the interior wall of the conceptacle."

Sargassum Filipendula Ag. 855, 1416, 1421, 1441. So. Norwalk; Seaside Park; on stones along the bar, Charles Island. Aug., Sept., Nov.

S. Filipendula forma *subedentatum* J. Ag. 1325, 1421. Sept. With the type.

Goniotrichum elegans (Chauv.) LeJolis. 179, 496, 497. Among *Sphacelaria radicans*, Seaside Park. Oct., Nov.

G. ramosum (Thwaites) Hauck. 1169. On *Ruppia*, among various small algae, Fresh Pond. Nov.

Bangia ciliaris Carm. 496, 507, 511, 532, 878, 888 = P. B.-A. 88, 889, 895. On *Zostera*, *Fucus vesiculosus*, *Sphacelaria cirrhosa*, etc., in company with *Goniotrichum*, *Erythrotrichia*, etc. Oct.-Dec. "We examined No. 887 this evening, and found numerous filaments fruiting. A cell forms a number of spores which escape from a lateral protuberance. The spores frequently lodge and germinate on filaments of the *Bangia*, giving it the appearance of branching."

B. fuscopurpurea (Dillw.) Lyng. 892, 894 = P. B.-A. 87b, 900, 901. On rocks and woodwork, near high water mark, Yellow Mill Bridge; Sea wall, Seaside Park. Nov., Dec.

Porphyra laciniata (Lightf.) Ag. 788, 1441b. On rocks, Seaside Park. Mar. Young plants, Nov.

P. leucosticta Thuret. 781, 784, 787, 791, 798, 1071, 1081, 1083, 1242 = P. B.-A. 376. On *Fucus*, rarely on stones, Seaside Park; Cook's Point. Jan.-Apr.

Erythrotrichia ceramicola (Lyng.) Aresch. 496, 725. With other algae on *Zostera* and *Fucus*, Seaside Park; Charles Island. Sept., Oct.

Acrochaetium Sagraeanum (Mont.) Bornet. (*Chantransia virgatula*, in part.) 17, 646, 701 = P. B.-A. 39, 708, 750, 757. On *Ruppia*, Fresh Pond. May, July-Nov.

Nemalion multifidum (Web. & Mohr) J. Ag. 1127. On rocks near low water mark, Stratford Shoal. July.

Gelidium crinale (Turn.) J. Ag. 712, 1539. Woodmont; Seaside Park. Sept.

Chondrus crispus (L.) Stack. 564, 1335. Woodmont. Cystocarps, Apr., Oct.

Phyllophora membranifolia (Good. & Woodw.) J. Ag. 1043, 1324, 1329, 1331, 1334 = P. B.-A. 379a, 1530. Dredged, Stratford Shoal; Penfield Reef; washed ashore, Woodmont. Aug.-Oct. Cystocarps, Sept., Oct.

P. Brodiaei (Turn.) J. Ag. 1042, 1330, 1332. Dredged, Stratford Shoal; Penfield Reef. Oct.

P. Traillii Holmes. 713. Sides of rocks, between tide marks, Woodmont. Sept.

Ahnfeltia plicata (Turn.) Fries. 26. Long Beach. June.

Sterrocolax decipiens Schmitz. On *Ahnfeltia*, No. 26.

Actinococcus subcutaneus (Lyng.) Schmitz. On *Phyllophora Brodiaei*, No. 1042.

Agardhiella tenera (J. Ag.) Schmitz. 176, 425, 434, 475, 493, 721, 759, 868, 962, 965, 972, 1029, 1148, 1338, 1410, 1411 = P. B.-A. 138, 1419. Seaside Park; Pleasure Beach; Cook's Point. July-Nov. Tetraspores, Aug., Sept., Nov.

Gracilaria multipartita (Clem.) Ag. 73, 423, 426, 682, 727, 852, 859, 875, 1037, 1478, 1479 = P. B.-A. 634, 1535. Seaside Park; Cook's Point; Fresh Pond; The Gut. July-Sept. Tetraspores, July. Var. *angustissima* Harv. much commoner than type.

Rhodymenia palmata (L.) Grev. 566, 1222, Woodmont; Long Beach. Apr., Nov.

Lomentaria uncinata Menegh. 400, 416, 430, 435, 442, 474, 695. Seaside Park; Stratford Point; Long Beach; Milford Point. Aug., Sept.

Champia parvula (Ag.) Harv. 436, 681, 856. Woodmont; Norwalk; Bridgeport harbor. Aug., Sept. Cystocarps, Aug.

Grinnellia Americana (Ag.) Harv. 55, 73, 370, 384, 387, 395, 398, 402, 404, 414, 427, 433, 623, 633, 653, 851, 854, 960, 963, 971, 1146, 1206, 1328, 1382 = P. B.-A. 593a, 1383, 1384 = P. B.-A. 593b, 1386, 1388, 1390, 1392, 1394, 1396, 1399, 1403, 1409, 1472, 1520, 1532, 1547. Floating, Seaside Park; Cook's Point; Pleasure Beach; On oyster shells and stones in The Gut. July–Sept. Cystocarps, tetrapores and antheridia, July. "May 9, Searched for Grinnellia but found none." "July, Young plants on Ascophyllum." "July 10, Floating very early in the season." "Aug. 10, No. 1409, old fronds with proliferations." "Aug. 25, No. 1532, old fronds covered with young plants from germinating spores."

Caloglossa Leprieurii (Mont.) J. Ag. 170, 171, 172, 175, 181, 545. Cook's Point. Oct., Nov., Jan. (See note under *Bostrychia rivularis.*)

Chondria tenuissima (Good. & Woodw.) Ag. 381, 418, 421, 857, 1136, 1142, 1401. On stones just below low water mark, Long Beach; So. Norwalk. July, Aug.

C. Baileyana Harv. 403, 406, 1028. On stones just below low water mark, The Gut. Aug.

Polysiphonia elongata (Huds.) Harv. 919. Seaside Park. Mar.

P. fastigiata (Roth) Grev. 479. On *Ascophyllum nodosum.* Woodmont. Oct.

P. Harveyi Bailey. 1534 = P. B.-A. 888. Charles Island. Aug. "On *Zostera*, natural color pink; sterile. (Reinsch's *P. Americana*?)"

P. Harveyi var. *arietina* Harv. 438, 866, 1541 = P. B.-A. 889. Flats near breakwater; Seaside park; Charles Island. Aug., Sept.

P. nigrescens (Dillw.) Grev. 317, 326, 488, 1046, 1193. Seaside Park; Cook's Point; dredged at Stratford Shoal. May, Oct.

P. nigrescens var. *affinis* (Moore) Harv. 563. Woodmont. Apr.

P. nigrescens var. *Durkeei* Harv. 853. Harbor. July.

P. nigrescens var. *fucoides* Harv. 944. Cook's Point. May.

P. Olneyi Harv. 441, 1134, 1135 = P. B.-A. 440, 1265, 1268, 1346, 1531. On rocks and shells, Fresh Pond. May, June, Aug., Sept. Tetraspores, May, June. "Dec. 12, in active vegetative condition; a large crop springing up, sterile."

P. urceolata (Lightf.) Grev. 338, 1361, 1500, 1514, 1552. Seaside Park; Charles Island. Apr.–June. Tetraspores, June.

P. urceolata var. *formosa* (Suhr) Ag. 242, 296, 300, 307, 562. Seaside Park; Woodmont. Jan., Apr.

P. variegata (Ag.) Zan. 70, 367, 373, 377, 386, 389, 394, 397, 413, 424, 467, 478, 492, 635, 655, 955, 1381, 1473, 1474 = P. B.–A. 639, 1477, 1528. Seaside Park; Cook's Point. July–Oct. Tetraspores, July.

P. violacea (Roth) Grev. 920. Seaside Park. Mar.

Bostrychia rivularis Harv. 169, 171, 172, 174, 180, 505, 545, 684. Cook's Point. Jan., Aug., Oct., Nov. "Up near high water mark where the stalks of *Salicornia* and a finish kind of grass stand thick together, mostly in the shade of *Spartina*, so that when left by the retreating tide these beds probably never become dry; there the bases of these plants and sometimes the bottoms of the sheaths of *Spartina*, and occasionally a little bit of *Fucus* are covered with a fine web of *Bostrychia*, among which are scattered fronds of *Delesseria Leprieurii*."

Rhodomela subfusca forma *gracilior* (Harv.) J. Ag. 561. Woodmont. Apr.

Dasya elegans (Mart.) Ag. 53, 66, 229, 361, 365, 376, 385, 388, 392, 393, 396, 401, 405, 415, 428, 466, 491, 506, 634, 654, 683, 760, 860, 961, 964, 970, 1205, 1327, 1336, 1337, 1387, 1389, 1391, 1393, 1395 = P. B.–A. 545, 1397, 1398, 1400, 1404, 1415, 1418, 1476. Penfield Reef; Seaside Park; Cook's Point; Long Beach; The Gut; Pleasure Beach. July–Dec. Cystocarps, tetraspores and antheridia. July.

Griffithsia Bornetiana Farlow. 399, 443, 1542. Floating, Seaside Park; Stratford Point; Charles Island. Aug., Sept., Oct. "Charles Island, small tufts floated ashore, globose antheridia-bearing cells few; vegetative tapering branches and antheridial branches on the same frond; rhizoidal processes very abundant."

Callithamnion Baileyi Harv. 238, 244, 251, 391, 538, 560, 589, 613, 1044, 1202, 1221, 1223, 1406. Floating, Seaside Park; Woodmont; Charles Island; Long Beach; covering *Chondrus* and other algae, Penfield Reef; dredged at Stratford Shoal. Jan., May–Aug., Oct.–Dec.

C. byssoideum Arn. 665. Black Rock Beacon. July.

C. corymbosum (Eng. Bot.) Ag. 690. Floating, Long Beach. Aug.

C. roseum (Roth) Harv. 1550. Floating, Charles Island. Apr. Cystocarps and tetraspores.

C. tetragonum (With.) Ag. 1551. Floating, Charles Island, Apr.

Pleonosporium Borreri (Eng. Bot.) Näg. 52, 69, 372, 390, 625, 638, 645, 665a, 876, 1031, 1140, 1402, 1405. On muddy rocks at light and spindles, and at beacon, Penfield Reef; Floating, Seaside Park; Woodmont; Long Beach; Charles Island. July–Sept. Tetraspores, Aug., Sept.

Seirospora Griffithsiana Harv. 1030. Scooped up from rocks below low water, Black Rock Beacon. Aug.

Antithamnion Americanum (Harv.) Farlow. 239, 243, 267, 301, 559, 590, 786, 1076, 1348, 1446, 1485, 1486, 1499, 1511, 1543. Floating, Seaside Park; Woodmont; Charles Island. Jan.–May.

A. cruciatum (Ag.) Näg. 469, 473, 499, 536, 614, 839, 1167. On algae and stones, Seaside Park; Long Beach; Woodmont. May–Dec.

Rhodochorton Rothii (Eng. Bot.) Näg. 189, 256, 269. On rocks, Seaside Park. Nov., Feb., March. Tetraspores, Feb., March.

Ceramium Capri-Cornu (Reinsch) Farlow. 173, 231, 1058. Washed ashore on *Zostera*, harbor. June, Oct. "Only an autumnal form of *C. strictum*, growing on *Zostera*. Of this I am convinced."

C. circinatum (Kütz.) J. Ag. 637. On *Fucus*, Woodmont. July.

C. fastigiatum Harv. 472, 1141. On *Zostera*, Long Beach. Aug., Sept.

C. rubrum (Huds.) Ag. 75, 360, 371, 1483. Seaside Park; Woodmont. July, Aug., Jan., "Luxuriant but sterile, on *Fucus*."

C. rubrum var. *secundatum* (Lyng.) Harv. 1523. The Gut. July.

C. botryocarpum Griff. (*C. rubrum* var. *proliferum* J. Ag.) 1138, 1475, 1522 = P. B.-A. 894, 1524, 1525, 1526, 1527. The Gut. July, Aug. Cystocarps and tetraspores, July. "Tetrasporic plants much less proliferous than the cystocarpic."

C. strictum (Kütz.) Harv. 63, 71, 353, 358, 359, 363, 368, 369, 374, 378, 411, 432, 437, 495, 858, 1139. Yellow Mill Bridge; on sand-covered rocks, Seaside Park; on *Zostera*, Cook's Point; Norwalk shore. June–Aug. Tetraspores, July. "432 passing into the form of *C. Capri-Cornu*; curved branchlets just starting out."

C. tenuissimum (Lyng.) J. Ag. 468, 471. On *Agardhiella*, Seaside Park. Sept.

C. tenuissimum var. *arachnoideum* (J. Ag.) Farlow. 154, 677, 1137. Always on *Zostera*; Milford Point; Woodmont; Long Beach. Aug., Sept.

Spyridia filamentosa (Wulf.) Harv. 762, 1422. Woodmont. Aug., Sept.

Gloiosiphonia capillaris (Huds.) Carm. 25. Floating, Long Beach. June.

Melobesia Lejolisii Rosanoff. 1147. On *Zostera*, Pleasure Beach. Sept.

Lithothamnion laevigatum Foslie. 615. On schistose rock, near low water mark, Woodmont. June.

Corallina officinalis L. 477. Woodmont. Oct.

Hildenbrantia Prototypus Nardo. 179. Seaside Park. Nov.

Connecticut Fresh Water Algae.

Chroococcus cohaerens (Bréb.) Näg. 776. Among other algae, on abutment of Factory Pond dam. Dec.

Coelosphaerium Kützingianum Näg. 1052. With other algae, on moist rocks, Sage's Ravine, below first falls, Twin Lakes, Salisbury. Oct.

Haematococcus pluvialis (Grev.) Flotow. 621, 629, 705. On dripping stonework, Factory Pond dam. July, Sept.

Gloeocapsa violacea (Corda) Rab. 1435 = P. B.–A. 551. Gaylordsville. Oct. "On vertical face of moist limestone, east side of road and a few rods from it, a mile or so from the station on the road to Bull's Bridge."

Arthrospira Gomontiana Setchell. 43, 345, 1126 = P. B.–A. 155, 1130. Pool below Factory Pond. June, July.

Oscillatoria amphibia Ag. 954. With *O. tenuis*, on muddy bottom of Bruce's Brook. July.

O. limosa Ag. 31, 50, 597, 747, 932 = P. B.–A. 253b. Stream in Stratford; Great Falls of the Housatonic; ditch below Factory Pond, floating and attached to plants; Berkshire Mill Pond. "1481, forming a dark purple stratum on plants in running water, Pequonnock River, below Factory Pond dam. Dec."

O. princeps Vauch. 161, 658 = P. B.–A. 2b, 850, 1413. West Branch of Bruce's Brook; Parrott's Pond; Fresh Pond, in company with *Lyngbya aestuarii*. July, Sept., Oct.

O. splendida Grev. 144, 775, 1063, 1149. Bed of Pequonnock River, in a still pool with decaying vegetable matter. Aug., Sept., Nov.

O. tenuis Ag. 143, 158, 164, 162, 584, 891, 954, 959, 1229. Floating, pool below Factory Pond; Housatonic River, on wall of quartz mill; Fresh Pond; Bruce's Brook. May–Oct.

O. tenuis var. *natans* (Kütz). Gomont. 1163, 1482. Bruce's Brook. Oct., Dec.

Phormidium Corium (Ag.) Gomont. 743, 924, 934 = P. B.–A. 304. On stonework of dam at R. R. crossing, Bruce's Brook; on dam at Moody's Pond; Island Brook, below Housatonic R. R., on woodwork of dam. Apr., May, Oct.

P. favosum (Bory) Gomont. 51. Stratum adhering to rocks in shoal running water. Great Falls of the Housatonic, below Lovers' Leap. July.

P. Retzii (Ag.) Gomont. 710 = P. B.–A. 3c, 716, 946, 958, 1414. Stream below Paper Mill, Pequonnock River; Rooster River. June, July, Sept.

P. uncinatum (Ag.) Gomont. 660, 947, 1420. "Forming a purplish or copperish skin on stones in stream below dam at Moody's Pond"; Mill River. June, July, Sept.

Lyngbya ochracea (Kütz.) Thuret. 1062, 1333. Stream below paper mill, Factory Pond; outlet of Parrott's Pond. Oct., Nov.

Plectonema Wollei Farlow. 166. On stones in swift running water, Housatonic River, below Great Falls. Oct.

Schizothrix lardacea (Cesati) Gomont. 1227. On vertical surface of dripping rock, East Rock, New Haven. Nov.

S. coriacea (Kütz.) Gomont. 1429, 1431, 1437, 1453. On limestone, bank of Housatonic River, Gaylordsville. Apr., Oct.

Anabaena oscillarioides Bory. 718. With other *Cyanophyceae*, pool below Factory Pond. Sept.

Cylindrospermum majus Kütz. 445. Forming saccate investments of grass, *Utricularia*, etc., pool below Factory Pond. Sept.

Nostoc commune Vauch. 1436. On limestone, road near Gaylordsville. Oct.

N. microscopicum Carm. 1053. Sage's Ravine, Salisbury, below first falls. Oct.

N. parmelioides Kütz. 1160. On stones in brook, Mt. Carmel. Sept.

N. pruniforme Ag. 1145 = P. B.–A. 657. Twin Lakes, Salisbury. Aug. "In stagnant arm of lower lake cut off by R. R. near station. Mostly resting on bottom, attached when young to sticks, stones, etc., growing up to a diameter of about 2 inches."

Scytonema crispum (Ag.) Bornet. 192, 1158, 1225. On rock below Factory Pond; ditch at North Haven. Sept., Nov. "Oct. 2, 1898, *Scytonema crispum* has disappeared from the old station in North Haven."

S. Hofmanni Ag. 740. On old stump, shore of upper Twin Lake, Salisbury. Oct.

S. Myochrous (Dillw.) Ag. 697, 739, 1048. "On rocks in upper Twin Lake, near shore, submerged, but alive to some extent above submerged portion." Oct.

S. figuratum Ag. 1427, 1428, 1438, 1454, 1517 = P. B.–A. 857. Banks of the Housatonic, near Gaylordsville, in tufts or sheets on limestone. June, Oct.

S. ocellatum (Dillw.) Thuret. 698. Sage's Ravine, Salisbury, on dripping rocks. Aug.

Nostochopsis lobatus Wood. 1159. On stones in brook at Mt. Carmel. Sept.

Tolypothrix lanata (Desv.) Wartmann. 182, 191, 216, 500, 706, 1153. On *Fontinalis* in Pequonnock River, below Factory Pond dam; Lake Saltonstall, near New Haven. Sept.–Dec.

Stigonema mamillosum Ag. 354, 628. On damp rocks in Mill River, near Samp Mortar Rock; on stones in Pequonnock River. July.

S. minutum (Ag.) Hass. 1050. On submerged rocks in Plantain Pond, Salisbury. Oct.

S. panniforme (Ag.) Born. & Flah. 1052. On moist rocks, Sage's Ravine, below first falls, Salisbury. Oct.

Amphithrix janthina (Mont.) Born. & Flah. 1434. Coating stones in Island Brook, below R. R. Oct.

Calothrix Braunii Born. & Flah. 503, 885, 903, 1061. Forming a coating on stones, side stream of Pequonnock River, below Factory Pond dam. Oct.

C. fusca (Kütz.) Born. & Flah. 544. On *Batrachospermum vagum*, pool below Factory Pond dam. Oct.

C. parietina (Näg.) Thuret. 733, 734 = P. B.–A. 11, 742, 1228, 1347. On stone dam of Factory Pond; on dripping rock by R. R.

between Canaan and Twin Lakes, Salisbury; on dripping rock, East Rock, New Haven; on sandy ground, shore of Fresh Pond. Oct.–Dec.

Dichothrix gypsophila (Kütz.) Born. & Flah. 1425, 1439. Gaylordsville, rapids of Housatonic River, near Kent, on limestone, river shore; narrow form, incrusted. Oct.

D. Hosfordii (Wolle) Born. & Flah. 501, 508, 514, 957 = P. B.–A. 215b, 1197. On stones on border of pool below Factory Pond, Pequonnock River. June, July, Oct., Nov.

D. Orsiniana (Kütz.) Born. & Flah. 1124, 1131 = P. B.–A. 405. On stone work at base of Factory Pond dam. July.

Gloiotrichia Pisum (Ag.) Thuret. 736, 737. Twin Lakes, Salisbury, floating and on pond weeds. Oct.

Spirogyra bellis (Hass.) Cleve. 882. Pequonnock River, Turnbull. Oct.

S. nitida (Dillw.) Link. 619, 620, 630 = P. B.–A. 513, 643. Island Brook, below dam at R. R. "July 19, Last of the season."

S. varians (Hass.) Kütz. 582. Roadside near Brookfield. May.

S. sp.? 595, 600, 607, 632, 652. Fresh Pond. May–July. 595. "Grows in abundance, floating in thick patches, along with *Cladophora*, *Enteromorpha*, etc. Dissepiments not replicate; diameter of cells uniformly about 37μ; length of cells 8–22 times the diameter; 1 or 2 spirals, making 2 or 3 to 10 or more turns; rarely 3 spirals." 607, "Spores seem to be forming in some cells without conjugation, after the manner described by DeBary (Die Conjugaten, p. 7, Pl. I. fig. 4). Sometimes 2 spores (?) in one cell; sporiferous (?) cells somewhat swollen, spores (those apparently nearest maturity) light buff colored, elliptical." 632, "In side pool from which I formerly took best specimens of *Monostroma latissimum*. Cells generally about 27 or 28μ in diameter, length generally 3–6 diameters, spirals 2 or rarely 3 turns, about 3 in a cell of full length. Dissepiments not replicate. Zygospores ellipsoidal, 56–87μ long by 31–37μ wide. Female cell swollen just enough to contain zygospore. With *Oscillatoria* which appears to be *O. princeps*. ?Whether this is not the same as 595. Water in this pool (which is now cut off from the main body by a sand bar) may be a little less salt; ?Whether this is the reason of its fruiting."[1]

Zygnema pectinatum var. *anomalum* (Hass.) Kirchn. 605. Pequonnock River, below Factory Pond dam. June.

Mougeotia robusta (DeBary) Wittr. 601, 606. Pequonnock River, below Factory Pond dam. June.

M. genuflexa (Dillw.) Ag. 668 = P. B.–A. 312, 952. Peck's Mill, Putney. July, Aug.

Tetraspora bullosa (Roth) Ag. 194, 222. Side stream of Pequonnock River, below Factory Pond dam, on stones, sticks, etc. Nov., Dec.

T. bullosa forma *cylindrica* (Hilse) Rab. 520, 521, 525. On plants and stones in Parrott's Pond. Nov.

T. lubrica var. *lacunosa* (Duby) Chauv. 195, 199, 208. Side stream of Pequonnock River, below Factory Pond dam; Stillman's Brook. March, Nov. 199, "Narrow, string-like fronds up to the length of 2 feet or more."

Gloeocystis rupestris (Lyng.) Rab. 746. With *Calothrix fusca*, etc., on stone work of Factory Pond dam. Oct.

Conferva bombycina forma *minor* Wille. 572, 717 = P. B.–A. 621, 827. Stream running into Bruce's brook, near horse-car stable; stream below paper mill, No. Bridgeport, with *Microspora stagnorum*. Apr., May, Sept.

Microspora abbreviata (Rab.) Lagerh. 925. Bruce's Brook. Apr.

M. amoena (Kütz.) Rab. 531, 928a = P. B.–A. 616. Bruce's Brook; stream below paper mill; Dec., Apr.

M. crassior (Hansg.) Hazen. 928a. Stream below paper mill, with *M. amoena*. Apr.

M. stagnorum (Kütz.) Lagerh. 602, 604 = P. B.–A. 618, 717. "Streamlet leaking through bank below the dam, Pequonnock River; some of it 2 ft. or more long; with *Conferva bombycina*."

Stichococcus flaccidus (Kütz.) Gay. 431. On bark of Horse Chestnut tree, Pembroke St., Bridgeport. Aug.

Ulothrix zonata (Web. & Mohr) Kütz. 945 = P. B.–A. 19a. On stones, Mill River, near Samp Mortar Rock. June.

Stigeoclonium tenue ? 603. Stream from paper mill, Factory Pond. June.

S. lubricum (Dillw.) Kütz. 811 = P. B.–A. 660. Little pond east of Yellow Mill Pond, near Stratford Cove. May.

S. fasciculare Kütz. 828 = P. B.–A. 67. Bruce's Brook. May.

S. flagelliferum Kütz. 1170, 1171 = P. B.–A. 408. On stones in swift water, Pequonnock River, in the new channel, below Factory Pond dam. Dec.

Draparnaldia glomerata (Vauch.) Ag. 203, 236, 246, 528, 549, 554, 1070. Side stream of Pequonnock River, below Factory Pond dam; Ash Creek. Nov.–Feb.

D. plumosa (Vauch.) Ag. 550, 551, 552. Stream below paper mill, at Factory Pond. Jan. Feb.

Chaetophora incrassata (Huds.) Hazen. 145, 184, 193, 200, 205, 211, 217, 223, 237, 409, 446, 527, 553, 1204. On stones, pool and side stream of Pequonnock River, below Factory Pond dam. Jan., Feb., July–Dec.

C. incrassata forma **draparnaldioides** (Wittr. & Nordst.) nov. comb. 286. *C. Cornu Damae* (Roth) Ag. *β draparnaldioides* Nordst. & Wittr. Stream in swamp, west of Stillman's Brook. March.

C. pisiformis (Roth) Ag. 408, 447, 661. On grass and stones, side stream of Pequonnock River, etc.; on stones in mill race below Moody's Pond. July–Sept.

Aphanochaete vermiculoides Wolle. 557a. On *Hyalotheca dissiliens*, Stratford. March.

Bulbochaete intermedia DeBary, 686 = P. B.–A. 973. On grass, etc., pool by Rooster River, near Spooner's farm. Aug.

Oedogonium crenulato-costatum Wittr. 836. In little pond east of Yellow Mill Pond, near Stratford Avenue. July.

Trentepohlia aurea (L.) Mart. 1055, 1424. Rocks by roadside near Hammerton; limestone rocks on river shore, Housatonic River, near Gaylordsville. Oct.

T. Iolithus (L.) Wittr. 1452. On northerly side of rocks, with lichens, Gaylordsville. Apr.

Rhizoclonium hieroglyphicum var. *macromeres* Nordst. 1162. Fitch's Pond, Cheshire. Sept.

R. lacustre forma *Americanum* Wille. 656, 657 = P. B.–A. 624. Attached to stones, Pequonnock River, below Factory Pond dam, growing to a length of 2 or 3 feet. July.

Cladophora callicoma Kütz. 347. Great Falls of the Housatonic, Still River station, Lanesville, on stones in rapids, below Lovers' Leap. June.

C. glomerata (L.) Kütz. 349. Still River station, Lanesville, on stones in swift water, just below the dam at silex mill. June.

Vaucheria aversa Hass. 670 = P. B.–A. 475. Mill River, near Samp Mortar Rock. Aug.

V. geminata (Vauch.) DC., type and var. *racemosa* (Vauch.) Walz. 567, 570, 571. Ash Creek, below mill at Moody's Pond. Apr.

Vaucheria sessilis (Vauch.) DC. 581. Brookfield. May.

Batrachospermum anatinum Sirdt.? "A single frond among Bats collected in Bruce's Brook, north of R. R., Apr. 20. Beautiful bluish green."

B. Boryanum Sirdt. 3, 7, 10, 16, 187, 196, 202, 206, 210, 212, 219, 228, 248, 252, 275, 283, 556. Mouth of little stream emptying into the east side of Berkshire Mill Pond; side stream of Pequonnock River, below Factory Pond dam. Feb., May, Nov., Dec.

B. Corbula Sirdt. 11 = P. B.–A. 184. In a little stream running through swamp near old quarry, northwest of poorhouse, May 11. "May 30, collected in same spot as May 11. Hunted the stream a long way. Could find none except in one spot within the space of a yard." 259, 292. On sticks in still water, upper part of pool below Factory Pond dam. Mar.–May.

B. ectocarpum Sirdt. 5, 289 = P. B.–A. 183. In side stream of Pequonnock River, below Factory Pond dam; Island Brook, near mouth. Jan.–March.

B. moniliforme var. *typicum* Sirdt. 22 = P. B.–A. 180. Island Pond Brook. May.

B. moniliforme var. *chlorosum* Sirdt. 2, 165, 186, 188, 197, 198, 201, 207, 209, 213, 215, 220, 226, 249. Side stream of Pequonnock River, below Factory Pond dam. Oct., Jan. "Oct. 5, the first Bat I have found here this season; could see none a week ago."

B. pyramidale Sirdt. 933 = P. B.–A. 186. On old sticks in still water, pool below Factory Pond dam. May.

B. vagum Ag. 8, 204, 214, 218, 224, 235, 247, 526, 631, 835, 884, 902, 1166. Outlet of little pond near paper mill, below Factory Pond dam. Oct.–Feb., Apr., June, July.

B. virgatum Sirdt. 15, 253, 270, 276, 284, 291, 825, 1165. Small stream running under R. R., a little way east of Stratford depot; Island Brook; Ash Creek, below saw mill; Pequonnock River, below Factory Pond dam. Nov., Feb.–May.

Lemanea fucina var. *rigida* (Sirdt.) Atk. 45, 350. Island Brook; Great Falls of the Housatonic, on rocks in the natural dam at the crest. June.

Tuomeya fluviatilis Harv. 24, 41, 44, 64, 516, 576, 883, 956, 1164, 1232. Pequonnock River; Island Brook; Mill River, near Samp Mortar Rock. May–July, Oct.–Dec. "Nov. 15, in great abundance in Pequonnock River, near old mill just above Trumbull line, at falls."

Newfoundland, July 13–30, 1897.

St. John's, July 13–16.

1273. *Nostoc muscorum* Ag. Signal Hill.

1274 = P. B.–A. 414. *Pylaiella littoralis* (L.) Kjellman. In pools and on rocks between tide marks, shore outside of entrance to the harbor; both forms of sporangia on the same individual.

1275 = P. B.–A. 982, 1276. *Cladophora Hystrix* Stromf. On rocks between tide marks, outside shore.

1277. *Fucus* sp.? "On rocks between tide marks, or at least where wet by spray."

1278. *Dictyosiphon hippuroides* (Lyng.) Aresch. Young plants in rock pools.

1279, 1281. *Rhodomela* sp? In rock pools in narrows, outside the harbor.

1280. *Polysiphonia urceolata* (Lightf.) Grev. On rocks in harbor near narrows.

1283. *Codiolum longipes* Foslie. Coating rocks within the narrows.

1284. *Phyllitis zosterifolia* Reinke. Coating rocks on ocean shore, between tide marks, outside the harbor.

1285. *Monostroma Groenlandicum* J. Ag. On rocks, ocean shore, north of entrance to harbor.

1286. *Halosaccion ramentaceum* (L.) J. Ag. On rocks in harbor near narrows.

1287. *Alaria esculenta* Grev? On rocks below the cliff, ocean shore, north of narrows.

1288. *Chorda tomentosa* Lyng. North side of harbor, near the narrows, attached to stones.

1289 = P. B.–A. 480. *Elachista lubrica* Rupr. On *Halosaccion*, 1286.

1290 = P. B.–A. 406. *Monostroma undulatum* var. *Farlowii* Rosenv. On rocks and on other algae, between tide marks in the narrows, south side.

1291. *Enteromorpha minima* Näg. On rocks between tide marks near narrows, north side.

1292. *Dictyosiphon foeniculaceus* (Huds.) Grev. Mostly epiphytic on *Chordaria flagelliformis*, near narrows.

1293. *Porphyra miniata* Ag. Very abundant.

Topsail, on Conception Bay, July 17.

1294. *Cladophora lanosa* var. *uncialis* (Harv.) Thuret. On rocks at low water.

1295. *Ectocarpus confervoides* (Roth) LeJolis. On algae.

1296. *Phyllitis fascia* (Fl. Dan.) Kütz. Rocks near low water mark.

1297. *Lithothamnion glaciale* Kjellm. Lying free near low water mark and below.

Windsor Lake, July 19.

1298. *Stigonema mamillosum* Ag. On rocks in shoal water.

Harbor Grace, July 21.

1299. *Cladophora* sp?

1300. *Corallina officinalis* L.

1301. *Ralfsia deusta* Aresch.

1302. *Rhodymenia palmata* (L.) Grev.

1303. *Ptilota pectinata* (Gunner) Kjellman.

1308. *Hormiscia penicilliformis* (Roth) Fries. On rocks between tides.

1309. *Elachista* sp? On *Fucus*.

Quidi Vidi, July 26.

1310. *Porphyra laciniata* (Lightf.) Ag. On rocks between tides.

1311. *Calothrix scopulorum* (Web. & Mohr) Ag. On rocks between tides.

1312 = P. B.-A. 337. *Porphyra miniata* Ag. On rocks at and below low water.

Petty Harbor, July 28.

1313. = P. B.-A. *Dictyosiphon hippuroides* (Lyng.) Aresch.

1314. *Chordaria flagelliformis* (Fl. Dan.) Ag. With 1313.

1315. *Hormiscia penicilliformis* (Roth) Fries. Rocks below tide marks.

St. John's, July 29.

1316. *Codiolum longipes* Foslie. Rocks in narrows.

Torbay, July 30.

1318. *Porphyra linearis* Grev. "Up to 2 feet in length and from ⅛ to 1 inch or a little more in width. Strong tendency to shut up on the median line. Fronds entire, attached to rocks by small stipe at the base. Between tide marks where surf beats upon precipitous rocks."

1319. *Phormidium Retzii* (Ag.) Gomont. On moss in stream, swift water, running into Torbay harbor.

Senecio Balsamitae, Muhl., var. **firmifolius**, Greenman, n. var. Stems 0.8 to 2 dm. high, more or less tufted: lower leaves mostly short-petioled, elliptic-oblong to subrotund, 0.5 to 4 cm. long, 5 to 20 mm. broad, crenate-dentate to sublyrately pinnatifid, thick and firm in texture, at first, as well as the stem, white tomentulose, but soon glabrate; upper stem-leaves much reduced and often prolonged into a linear entire attenuation: involucre and technical characters of the head like the species. — In red limestone detritus, crest of Les Murailles, Percé, Gaspé County, Quebec, 17 August 1904, *J. F. Collins, M. L. Fernald & A. S. Pease* (type, hb. Gray); also in limestone detritus, Mont Rouge, Percé, 23 July 1905, *J. F. Collins & M. L. Fernald* (hb. Gray). Specimens secured by Messrs. Collins and Fernald at Cap Barré, Percé, 23 July 1905, are distinctly intermediate between the variety and typical examples of the species. The variety is distinguished chiefly by the short relatively broad leaves and their thick firm texture. — J. M. Greenman, Field Columbian Museum, Chicago.

A Pale Form of Avena striata.— *Avena striata* Michx. has the empty glumes and often the flowering glumes strongly tinged with purple — so much so as to have received from Torrey the name *Trisetum purpurascens*. On some of the mountains of Maine and eastern Quebec, however, the prevailing form of the plant quite lacks this purple coloring which is so characteristic of the species, and has instead whitish or pale straw-colored empty glumes and pale flowering glumes. The plant seems to have no other distinguishing character, but in the regions where it occurs it is so constant and characteristic as to merit the distinctive name: —

Avena striata Michx., forma **albicans**, f. nov. Glumis externis albicantibus vel flavescentibus haud purpurascentibus, glumis fertilibus flavescentibus vel fulvis.— Quebec, abundant on mossy tableland, altitude 900–1050 meters, Mt. Albert, August 9, 1905 (*Collins & Fernald*, no. 26); limestone-conglomerate cliffs, Bic, July 16, 1904 (*Collins & Fernald*): Maine, slides, west wall, North Basin, and Saddle Brook, Mt. Katahdin, July 13, 1900 (*Williams & Fernald*). — M. L. Fernald, Gray Herbarium.

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NOTES ON NEW ENGLAND VIOLETS, — III.

EZRA BRAINERD.

STUDIES of our white stemless violets for three seasons past have brought to light several interesting and important facts. The Linnean species, *Viola primulifolia* and *V. lanceolata*, seem to be, at least in the Northern States, well defined and properly understood. For many years the remaining forms of the group passed as one species under the name *V. blanda*, Willd. (1804). LeConte in 1828 was the first to separate from this aggregate his *V. amoena*; and in 1870 Dr. Gray distinguished *V. renifolia.* But it is important in this work of segregation to find out just what Willdenow had before him and described as *V. blanda.* It appears to have been a living plant sent from near Philadelphia and grown in the gardens at Berlin. It may be that a dried specimen of it was never made; at least, Dr. Robinson, who the past summer made a search for the type in the Berlin herbaria, reports that none is to be found.

But with the publication of *Viola blanda* was issued an admirable colored plate; regarding this Dr. Britton observed in a letter last May: "It looks to me as though the original figure of *V. blanda* represents what we are calling *V. Leconteana*" (*V. amoena*, LeConte). I have examined this plate both at the Herbarium of the New York Botanical Garden and at the Gray Herbarium. The hand coloring in both copies is quite the same, and represents the peduncle and petioles and even the midrib as reddish, — a good character of *V. amoena*, but one never seen in what has been passing with us as *V. blanda.* Furthermore, the outline of the leaf, its crenation, and the structure of the flower plainly indicate the first mentioned spe-

cies. Several good judges at both New York and Cambridge were asked their opinion of the species figured, and all without hesitation called it *V. Leconteana* or *V. amoena*.

Moreover, in Willdenow's description particular emphasis seems to be laid on the fact that the petals are all beardless.[1] This is strictly true of *Viola amoena*; but the lateral petals of the so-called *V. blanda* have almost always more or less of a beard. The upper petals Willdenow thus describes: "bina superiora lanceolata obtusa alba." This might answer for the long narrow upper petals, rounded at the tip, of *V. amoena*; but it is decidedly inapplicable to those of the so-called *V. blanda*, which are broadly obovate or even orbicular. Much as we may regret the necessity, the name *V. blanda* must be restored to its original application, displacing *V. amoena* and the later synonyms.

This forces us to find another name for the species that we have been wrongly calling *V. blanda*; and fortunately there is an old name of Banks's that seems to be available and not altogether infelicitous. In the Prodromus, i. 295 (1824), under Banks's manuscript name "*Viola rotundifolia, β. pallens*," DeCandolle describes a sheet of specimens collected by Banks in Labrador. This type is now in the Banks Herbarium at the British Museum, and was studied and photographed by Mr. Fernald in 1903. He then felt no hesitation in pronouncing the plants to be what we have been calling *V. blanda*, the smallest of our white violets. Two excellent photographs of this sheet show seven plants, each with one flower and two or three leaves, and strongly support Mr. Fernald's conviction as to the species here represented. The plant is certainly not the true *V. blanda* above discussed; and it is extremely doubtful if the latter species reaches as far to the north as Labrador. In the mountains of Vermont the traditional *V. blanda* ascends some 2000 feet higher than the true *V. blanda* (*V. amoena*).

But in this group of plants there is another though quite different source of confusion, — the presence of a distinct but heretofore unrecognized species, that in its vernal stages has commonly passed as "*V. blanda*" (Am. authors), and in its summer stages as *V. amoena*

[1] This is stated in three places: (1) "petalis imberbibus"; (2) "petalis albis omnibus interne laevibus"; (3) "a Viola cucullata, obliqua et nonnullis aliis novis speciebus Americae borealis, petalis lateralibus basi glabris nec barbatis . . . diversa."

(the *V. blanda* of Willdenow). It is indeed more nearly related to the latter than to the former, which, as will be seen in the synopsis below, is in a group radically distinct from all the other round-leaved white violets. But although the new species is allied to the *V. blanda* of Willdenow, it differs from it in having on the expanding leaves and peduncles a white, villose, often dense pubescence that mostly persists through the summer, in having bearded lateral petals, and in having its upper petals broadly obovate, instead of long, narrow, and strongly reflexed. From *V. renifolia* the new species differs in its bearded lateral petals, and in its acute leaves longer than broad, excepting the one or two that appear earliest.

Fine specimens of the four species under discussion were grown in pots through the past season, and were under frequent inspection; in foliage and in general aspect the four were all strikingly distinct. The new species is plainly northern, and grows even to the summit of the highest peaks of Western New England, such as Greylock and Equinox.

I must furthermore state, though with regret, that the three woodland species, when growing together, are disposed, like the blue violets, to produce intermediate forms. This has been a further source of confusion; but we may hope that in due time after patient study this perplexity also may be unraveled.

Synopsis of the New England Species of White Acaulescent Violets.

* Cleistogamous capsules oblong, green, subtended by linear-lanceolate sepals; seeds black, about 1 mm. long; peduncles erect or ascending. Usually in open bogs, wet meadows and on borders of brooks.

1. V. lanceolata, L. Leaves narrowly lanceolate.

2. V. primulifolia, L. Leaves ovate, acute, with subcordate or tapering base.

3. **V. pallens** (Banks), n. comb. Leaf-blades cordate, obtuse or rarely acute, glabrous on both sides; petioles and scapes often with scattered hairs, not spotted with red; lateral petals beardless or with a few rudimentary hairs, upper petals broadly obovate. — *V. rotundifolia*, *β. pallens*, Banks in DC. Prodr. i. 295 (1824); *V. blanda* of recent American authors, not Willdenow. — Northeastern North America, from Labrador to "the mountains of South Carolina and Tennessee"[1]; and apparently westward.

[1] Pollard in Small's Flora of the Southeastern United States.

* * Cleistogamous capsules ovoid, commonly brownish purple, subtended by ovate-lanceolate sepals ; seeds brown, 1.6–2 mm. long ; peduncles horizontal or deflexed.— Usually in cold rich woodlands.

4. V. blanda, Willd. Glabrous except for minute white hairs on the upper surface of the leaves, especially the basal lobes; leaves cordate-ovate, acute or acuminate; petioles and scapes usually spotted with red ; petals all beardless, the upper pair often long, narrow, and strongly reflexed, sometimes twisted; usually in flower 10–20 days later than the two following species.— Hort. Berol. t. 24 (1804); *V. amoena*, LeConte, Ann. Lyc. N. Y. ii. 144 (1828) ; *V. Leconteana*, G. Don, Gen. Syst. i. 324 (1831) ; *V. blanda*, var. *palustriformis*, Gray, Bot. Gaz. xi. 255 (1886); *V. alsophila*, Greene, Pitt. iv. 7 (1899).— Quebec to Minnesota, and south to Georgia and Alabama.

5. **V. incognita,** n. sp. Peduncles, petioles and lower surface of leaves pubescent with soft white hairs especially when young, the upper leaf-surface glabrous or nearly so ; aestival leaves large, rugose, broadly cordate-ovate, acute ; lateral petals bearded, upper pair obovate; flowering early. — Type in Hb. Gray from wooded slopes of Moosalamoo Mountain, Salisbury, Vermont, May 5, 1903, and August 14, 1905. — Common from eastern Quebec and Prince Edward's Island westward and southward through the mountains of northern and western New England.

6. V. renifolia, Gray. More or less pubescent, but upper surface of reniform leaves often quite glabrous; petals all beardless, the upper pair orbicular; flowering early. — Proc. Am. Acad. viii. 288 (1870); *V. Brainerdii*, Greene, Pitt. v. 89 (1902), in part.— Newfoundland to the Mackenzie River, south to New England, New York, Michigan and Minnesota.

Middlebury, Vermont.

A NORTHERN CYNOGLOSSUM.

M. L. Fernald.

Cynoglossum virginicum L., as accepted by American botanists, is supposed to extend northward into the Maritime Provinces and southward to Florida and Louisiana, a range much broader than is covered by most of our Eastern plants. In New England and eastern Canada, where the introduced *C. officinale* often abounds, the indigenous species of *Cynoglossum* is very local, and it is only occasionally that one has an opportunity to study the native plant in the field. In July, 1905, however, while ascending with Messrs. E. F. Williams and J. F. Collins, the Little Cascapedia River in the County of Bonaventure, Quebec, I found a colony of the plant growing under larches in dry sandy alluvium. The characteristic species of the alluvium, *Arnica mollis*, *Dryas Drummondii*, *Astragalus frigidus*, var. *americanus*, *Sisyrinchium montanum*, *Calamagrostis Scribneri*, etc., were all high-northern or Rocky Mountain species; and it was, therefore, surprising to find with them a plant supposed to extend to Florida and the lower Mississippi.

Later study of the plant from the Little Cascapedia shows that in many points it differs from the plant of the Southern and Middle States, though it is quite like that of adjacent Canada, northern New England and New York, the Great Lakes and the northern Rocky Mountains. The more southern plant, the true *Cynoglossum virginicum* of Linnaeus, possibly extends into western New England, and plants under that name have been reported from western Massachusetts and Connecticut. Mr. E. B. Chamberlain in his study of the New England *Boraginaceae*,[1] however, was unable to verify the reports and the most northern material at hand comes from New Jersey and Pennsylvania. From there it extends southward, mostly in deciduous woods to the Gulf of Mexico, and west to Missouri and Texas. It is villous-hispid nearly to the inflorescence, and all but the very lowermost leaves are clasping. In anthesis its calyx is 3.5–4.5 mm. long; and its corolla 10 or 12 mm. broad, with suborbicular lobes and closed sinuses. The strongly echinate compressed orbicular-obovoid nutlets are cuneate at base, 7–9 mm. long.

[1] Rhodora, iii. 214.

In the northern plant, which usually occurs in coniferous woods, the slender peduncles are mostly appressed-pubescent, and the transition is more gradual than in *Cynoglosum virginicum* from the lower long-petioled to the upper amplexicaul leaves. The calyx in anthesis is 2–2.5 mm. long; the corolla 6–8 mm. broad, with ovate-oblong lobes and open sinuses; and the compressed pyriform-obovoid nutlets are 4–5 mm. long. This northern plant is of broad range in Canada and the Northern States, while the southern *Cynoglossum virginicum* is only doubtfully reported from southern New England. That the two are distinct species seems clear from the characters above enumerated, and the northern plant may be distinguished as

Cynoglossum **boreale**, sp. n. Planta 4–8 dm. alta; caule basi villoso-hispido, pedunculis elongatis (usque ad 1–2 dm. longis) appresso-pubescentibus; foliis radicalibus ellipticis vel lanceolato-ovalibus 1–3 dm. longis hispidis lamina petiolo fere aequanti, caulinis in petiolum brevem attenuatis vel subamplexicaulibus, superioribus oblongis 7–16 cm. longis basi auriculis rotundatis amplexicaulibus; racemis geminis 4–8-floris deinde 1–2 dm. longis; pedicellis fructiferis patente recurvis infimis 1.5–3 cm. longis; calycibus appresso-pubescentibus 2–2.5 mm. longis, lobis ovato-lanceolatis; corollis 6–8 mm. latis, lobis ovato-oblongis; nuculis tumidis ovoideo-pyriformibus glochidiato-echinatis 4–5 mm. longis. — Quebec, beneath *Larix* in sandy alluvial woods, Little Cascapedia River, July 17, 1905 (*Williams, Collins & Fernald*): New Brunswick, gorge of Aroostook River, July 17, 1902 (*Williams, Collins & Fernald*): Maine, woods, Orono, June 17, 1873 (*F. Lamson-Scribner*), June 5, 1898 (*E. D. Merrill*); open woods, South Chesterville, June 23, 1902 (*L. O. Eaton*); Harrison (*A. P. Chute*): New Hampshire, Franconia, June 16, 1886, June 14, 1887 (*E. & C. E. Faxon*): Vermont, Bristol, May 26, 1898, and woods near Lake Dunmore, Salisbury, June 2, 1898 (*E. Brainerd*): New York, Salamanca (*G. W. Clinton*): Michigan, Sault Ste. Marie, June, 1831 (*Houghton*); Copper Harbor, August, 1885 (*O. A. Farwell*, no. 295): Ontario, sandy woods, Nipigon River, July 3, 1884 (*J. Macoun*): British Columbia, Donald, Columbia Valley, July 3, 1885 (*J. Macoun*).

Gray Herbarium.

A CONTRIBUTION TO THE DESMID FLORA OF NEW HAMPSHIRE.

Joseph A. Cushman.

(*Continued from page 119.*)

Euastrum Ehrenb.

E. crassum (Bréb.) Kütz. (*E. magnificum*, var. *crassioides* Hast.) Length 155–176 μ: breadth 78–90 μ: isthmus 25–28 μ: breadth of polar lobe 42–61 μ. North Woodstock! Pudding Pond, North Conway! Rochester (*Hastings*).

* Var. **pulchrum** var. nov. (Plate 64, fig. 1). Variety with four small central granules and an abundance of smaller granules arranged as in the figure, in form more like the typical form than like var. *scrobiculatum*. Length 155 μ: breadth 75 μ: isthmus 25 μ: breadth of polar lobe 46 μ. Pudding Pond, North Conway! (Herbarium Cushman no. 118).

Var. ornatum (Wood) Hansg. (*E. ornatum* Wood.) Length 175 μ: breadth 95 μ: isthmus 25 μ: breadth of polar lobes 56 μ. Pudding Pond, North Conway, frequent! Saco Lake (*Wood*).

E. multilobatum Wood. Length 130 μ: breadth 65 μ: isthmus 18 μ: breadth of polar lobe 21 μ. Intervale! Pudding Pond, North Conway! Saco Lake (*Wood*).

E. pinnatum Ralfs. Length 133 μ: breadth 72 μ: isthmus 17 μ: breadth of polar lobe 35 μ. North Woodstock, common!

* E. cuneatum Jenner. Length 102–140 μ: breadth 59–62 μ: isthmus 14–15 μ: breadth of polar lobe 28–33 μ. Mt. Moosilauke!

* Var. **granulatum** var. nov. Variety with the surface covered with fairly large granules. North Woodstock!

E. Wollei Lagerh. Length 170 μ: breadth 108 μ: isthmus 21 μ: breadth of polar lobe 60 μ. Surface granular. Pudding Pond, North Conway!

E. ansatum Ehrenb. (*E. Ralfsii* Wood.) White Mountains, (*Wood*).

* As in the preceding part of this paper, starred forms are new to the New England Flora.

E. didelta (Turp.) Ralfs. Length 98–152 μ: breadth 56–75 μ: isthmus 15–19 μ: breadth of polar lobe 20–31 μ. Intervale! Pudding Pond, North Conway!

E. ampullaceum Ralfs. Length 90–100 μ: breadth 56–59 μ: isthmus 13–17 μ: breadth of polar lobe 23–25 μ. Pudding Pond, North Conway, frequent!

* Forma scrobiculatum Nordst. Noone's Station! (H. C. no. 392).

E. verrucosum Ehrenb., var. reductum Nordst. Length 78 μ: breadth 65 μ: isthmus 16.5 μ: breadth of polar lobe, 32 μ. North Woodstock! (H. C. no. 187).

E. circulare Hass. Length 65 μ: breadth 43 μ: isthmus 12.5 μ: breadth of polar lobe 19 μ. Intervale!

Var. Ralfsii Wood. Saco Lake (*Wood*).

E. gemmatum (Bréb.) Ralfs. Length 40 μ: breadth 31 μ: isthmus 8 μ: breadth of polar lobe 15 μ. Intervale. Meredith (Herbarium Johnson no. 369). Plymouth and Laconia (*Wests*).

E. Hastingsii Wolle. Cocheco River (*Wolle*).

E. binale (Turp.) Ehrenb., var. elobatum Lund. Length 25 μ: breadth 18.5–20 μ: isthmus 4.5–5 μ: breadth of polar lobe 10 μ. North Woodstock (H. C. no. 186)! Pudding Pond, North Conway!

* Var. insulare (Roy) Wittr. Length 28 μ: breadth 19 μ: isthmus 5 μ. Mt. Moosilauke (H. C. no. 80)!

E. elegans (Bréb.) Kütz. White Mountains (*Wood*).

E. inerme Lund. Length 50–65 μ: breadth 34–42 μ: breadth of polar lobe 10–12 μ. Intervale! Noone's Station!

E. denticulatum (Kirch.) Gay. Length 37 μ: breadth 27 μ: isthmus 6.4 μ: breadth of polar lobe 20 μ. Pudding Pond, North Conway (H. C. no. 123)!

* E. pyramidatum West. Length 23 μ: breadth 19 μ: isthmus 5 μ: breadth of polar lobe 14 μ. Pudding Pond, North Conway! (H. C. no. 123). The American specimens do not differ materially from the British ones.

E. evolutum (Nordst.) W. & G. S. West. var. integrius W. & G. S. West (*E. spinosum* Wolle). Length 53–59 μ: breadth 35–36 μ: isthmus 8.5–9.5 μ: breadth of polar lobe 28–31 μ. Pudding Pond, North Conway! Intervale!

* E. papilio Racib.? Length 56 μ: breadth 37 μ: isthmus 10 μ:

breadth of polar lobe 26 μ. North Woodstock (H. C. no. 190)! A single semi-cell was all that was seen of this species and it is therefore referred here with somewhat of a question. The finding of more material may show it to be a new species.

* E. Ciastonii Racib. Length 44 μ: breadth 26 μ: isthmus 5.5 μ: breadth of polar lobe 20 μ. Noone's Station (H. C. no. 394)! This species has been reported from Florida by the Wests.

E. fissum W. & G. S. West. var. ***Americanum*** var. nov. (Plate 64, fig. 2). Length 44 μ: breadth 25 μ: isthmus 4.5–6 μ. Variety differing considerably in ornamentation from the typical having a rounded granule at each side of the polar incision, a ring of eight granules about the base of protuberance of each semi-cell and with double instead of single granulations at the base. Pudding Pond, North Conway (H. C. no. 129)! The species is new to U. S. having been described from Ceylon.

Micrasterias Ag.

M. Torreyi Bail. Length 215 μ: breadth 310 μ: breadth of polar lobe 90 μ: isthmus 35 μ. Pudding Pond, North Conway, rare! Surface slightly roughened with minute granules.

M. radiosa Ag. Length 158 μ: breadth 148 μ: isthmus 21 μ: breadth of polar lobe 36 μ. Pudding Pond, North Conway!

Var. Swainei (Hastings) W. & G. S. West. Rochester (*Wolle*).

M. rotata (Grev.) Ralfs. Length 242 μ: breadth 226 μ: isthmus 27 μ: breadth of polar lobe 57 μ. Pudding Pond, North Conway!

M. denticulata Bréb. Length 280–310 μ: breadth 240–300 μ: isthmus 30–42 μ: breadth of polar lobe 65–76 μ. Intervale! North Woodstock! Pudding Pond, North Conway! Hanover (*Edwards*).

M. fimbriata Ralfs. Rochester (*Wolle*).

M. furcata Ag. Length 150–186 μ: breadth 124–150 μ: isthmus 22–23 μ: breadth of polar lobe 62–94 μ. Noone's Station, frequent!

* Var. simplex Wolle. Length 190 μ: breadth 186 μ: isthmus 18 μ. Pudding Pond, North Conway! Although it has been conclusively shown that this variety grades into the typical form, it is noteworthy that in this particular instance, the two forms were distinct in the localities given, and no traces of the other form seen in either case.

M. ringens Bail., var. serratula Wolle. Laconia (*Wests*, H. J. nos. 650, 679)!

M. Americana (Ehrenb.) Ralfs. Length 140 μ: breadth 125 μ: isthmus 28 μ: breadth of polar lobe 77 μ. North Woodstock!

Var. recta Wolle. Length 143 μ: breadth 121 μ: isthmus 28 μ: breadth of polar lobe 65 μ. North Woodstock (H. C. no. 179). Although this is of about the same size as the typical form the whole character of the end lobe is quite different.

M. Mahabuleshwarensis Hobson. Meredith, rare (*Johnson*).

M. Nordstedtiana Wolle. Breadth 170 μ. Meredith, rare (*Johnson*).

M. crenata Bréb. Hanover (*Edwards*).

M. truncata (Corda) Bréb. Length 77–118 μ: breadth 82–105 μ: isthmus 21–24 μ: breadth of polar lobe 60–78 μ. Intervale! Pudding Pond, North Conway!

M. laticeps Nordst., forma major Nordst. Length 150 μ: breadth 198 μ: isthmus 31 μ. Pudding Pond, North Conway, rare!

M. pinnatifida (Kütz.) Ralfs. Length 56–65 μ: breadth 68–72 μ: isthmus 9.5 μ: breadth of polar lobe 50 μ. Intervale! Pudding Pond, North Conway!

M. depauperata Nordst., var. Wollei Cushman. Length 140 μ: breadth 130 μ: isthmus 25 μ: breadth of polar lobe 90 μ. Pudding Pond, North Conway, rare!

M. foliacea Bail. Length 80–96 μ: breadth 80–85 μ: isthmus 14.5–15 μ: breadth of polar lobe 36–38 μ. Pudding Pond, North Conway, rare! Laconia, rather scarce in a pond on a stream flowing from Lake Winnepesauke (*Wests*, H. J. no. 665)!

M. muricata Bail. Length 160–180 μ: breadth 120–140 μ: isthmus 21–22 μ: breadth of polar lobe 120–140 μ. Pudding Pond, North Conway, rare!

* Forma **minor** forma nov. Length 123 μ: breadth 84 μ: isthmus 16 μ: breadth of polar lobe 84 μ. Intervale!

Cosmarium (Corda) Lund.

C. connatum Bréb. (*Calocylindrus connatus* Wolle, '92). Length 53–56 μ: breadth 40–45 μ: isthmus 37–42 μ. Pudding Pond, North Conway! Intervale!

C. pseudoconnatum Nordst. (*Calocylindrus pseudoconnatus*

Wolle, '92). Length 32 μ: breadth 22 μ: isthmus 20 μ. Intervale, frequent!

*C. THWAITESII Ralfs. (*Calocylindrus Thwaitesii* Wolle, '92). Length 133 μ: breadth 50 μ: isthmus 40 μ. North Woodstock (H. C. no. 183)!

C. MONILIFORME (Turp.) Ralfs., forma ELONGATA W. & G. S. West. Length 41 μ: breadth 11 μ: isthmus 7 μ. Laconia (H. J. no. 658).

C. VIRIDE (Corda) Josh. Length 48–49 μ: breadth 25–26 μ: isthmus 20 μ. Holderness (*Wests*).

C. GLOBOSUM Bulnh., var.* SUBARCTOUM Lagerh. Length 13.5 μ: breadth 11 μ: isthmus 8 μ. Pudding Pond, North Conway (H. C. no. 129)! Variety new to the U. S.

C. CONTRACTUM Kirch. Length 56 μ: breadth 40 μ: isthmus 12.5 μ. North Woodstock!

*C. OBLIQUUM Nordst., var. TRIGONUM West. (Plate 64, fig. 4). Length 25 μ: breadth 19 μ: isthmus 10 μ. Mt. Moosilauke (H. C. no. 78)! Variety new to U. S.

C. BAILEYI Wolle. Length 40 μ: breadth 45 μ: isthmus 15 μ. Squam Lake!

C. REGNESII Reinsch. Length 12 μ: breadth 12 μ: isthmus 5 μ: thickness 5 μ. Laconia (*Wests*).

C. EXIGUUM Arch., forma* MAJOR Nordst. Length 37 μ: breadth 25 μ: isthmus 5 μ. Pudding Pond, North Conway! The typical form was reported by Wolle from Florida, the variety is new to U. S.

C. NITIDULUM DeNot. Length 28 μ: breadth 25 μ: isthmus 6 μ. Pudding Pond, North Conway!

C. PYRAMIDATUM Bréb. Length 78–100 μ: breadth 52–59 μ: isthmus 9–18 μ. North Woodstock! Noone's Station!

C. PSEUDOPYRAMIDATUM Lund. Length 56 μ: breadth 40 μ: isthmus 11 μ. Intervale!

***C. claviferum** sp. nov. (Plate 64, fig. 3). C. of medium size nearly twice as long as wide, surface punctate, the side of each semi-cell with ten scattered granules arranged as in the figure; at the end are four granules arranged in a diamond form, below near the base are four more granules in a curve the two outer ones being larger than the inner two, at each side of the semi-cell are two other granules: ends of the semi-cells thickened, median region at the isthmus depressed. Length 44 μ: breadth 26 μ: isthmus 8.5 μ. Pudding Pond, North Conway!

C. pachydermum Lund., forma* minor Nordst. Length 73 μ: breadth 45 μ: isthmus 18.5 μ. Pudding Pond, North Conway!

C. perforatum Lund. Length 61 μ! breadth 57 μ: isthmus 34 μ. Plymouth and Laconia (*Wests*).

C. capense DeToni. Length 76 μ: breadth 68–75 μ: isthmus 36 μ: Pudding Pond, North Conway!

C. taxichondrum Lund., forma bidentulum Lagerh. Length, 40–42 μ: breadth 40–46 μ: isthmus 12–13 μ. Pudding Pond, North Conway! Intervale! Noone's Station!

C. subnudiceps W. & G. S. West. Length 44 μ: breadth 34 μ: isthmus 8 : thickness 16 μ. Laconia (*Wests*).

C. cosmetum W. & G. S. West. Length 53 μ: breadth 43 μ: isthmus 13 μ: thickness 28 μ. Laconia (*Wests*, H. J. no. 672)!

C. quinarium Lund. Length 38–40 μ: breadth 34–37 μ: isthmus 8–10 μ. Pudding Pond, North Conway! Intervale! Mt. Moosilauke!

C. triplicatum Wolle. Length 53 μ: breadth 39 μ: isthmus 12.4 μ. Holderness (H. J. no. 375)! and Plymouth (*Wests*).

C. polymorphum Nordst. Length 40 μ: breadth 31 μ: isthmus 7 μ. Intervale!

C. Raciborskii Lagerh. Length 44–48 μ.: breadth 50–53 μ: isthmus 20–21 μ. Meredith, very rare (*Johnson*): Laconia, occasional (*Wests*).

C. Boeckii Wille. Length 28 μ: breadth 30: isthmus 7 μ. Squam Lake!

C. tetropthalmun (Kütz) Menegh. Length 57–81 μ: breadth 53–60 μ: isthmus 14–22 μ. Intervale! Pudding Pond, North Conway, common!

C. margaritatum (Lund.) Roy & Biss. Length 90 μ: breadth 72 μ. Meredith, rare (*Johnson*).

C. pseudoorbiculare Cushman. Length 29–32 μ: breadth 21–24 μ: isthmus 8 μ. Intervale! Squam Lake!

C. intermedium Delp. Length 62 μ: breadth 53 μ: isthmus 21 μ: thickness 33 μ. North Woodstock!

*C. Favum W. & G. S. West. Length 70 μ: breadth 60 μ: isthmus 21 μ. Pudding Pond, North Conway! Slightly larger than the measurements of the type. As this species was described simply as North American this is its first definitely recorded locality.

C. dentatum Wolle. Length 125 μ: breadth 102 μ: isthmus 25μ. Squam Lake!

C. LATUM Bréb. Meredith (*Wests*).

C. RENIFORME Arch., var. COMPRESSUM Nordst. Length 55 μ: breadth 53 μ: isthmus 17 μ: thickness 27 μ. Laconia (*Wests*, H. J. no. 661)!

C. OCTHODES Nordst. Length 69 μ: breadth 56 μ: isthmus 15 μ. Intervale!

* C. QUADRUM Lund., forma **Johnsoni** forma nov. (*C. quadrum* Lund, forma. Johnson, Bull. Torr. Bot. Club., v. 22, 1895 (July) p. 294, Pl. 240, f. 22). Length 44 μ: breadth 40 μ: isthmus 14 μ. Plymouth (H. J. no. 359).

* C. GRANDIFORME Schmidle, var. **Americana** var. nov. (Plate 64, fig. 5). Length 53 μ: breadth 35 μ: isthmus 18 μ. This variety is considerably smaller than the typical, in other points not varying greatly. Species new to U. S. Pudding Pond, North Conway!

C. SUBORBICULARE Wood. (*C. isthmochondrum* Nordst.) Length 31 μ: breadth 28 μ: isthmus 5 μ. Pudding Pond. North Conway! Saco Lake (*Wood*). As it seems certain that both of the above names represent a single species the older name of Wood should be retained.

C. CYCLICUM Lund. Meredith (*Johnson*).

C. AMOENUM Bréb., var. TUMIDUM Wolle. Length 40–47 μ: breadth 22–25 μ: isthmus 12 μ. Pudding Pond, North Conway! North Woodstock!

* C. HOMALODERMUM Nordst. Length 43 μ: breadth 37 μ: isthmus 7 μ. Intervale!

C. PHASEOLUS Bréb., var. ELEVATUM Nordst. Length 41 μ: breadth 25 μ: isthmus 5 μ. Var. new to U. S. Pudding Pond, North Conway!

C. RECTANGULARE Grun. Length 38 μ: breadth 30 μ: isthmus 10 μ: thickness 18 μ. Laconia occasional (*Wests*).

C. PYGMAEUM Arch., var. SCHLIEPHACKEANUM (Bréb.) W. & G. S. West. (*C. Schliephackeanum* Wolle, '92). Laconia occasional (*Wests*).

C. SINOSTEGOS Schaarschm., var. OBTUSIUS Gutw. Length 10 μ: breadth 8 μ: isthmus 3 μ: thickness 4 μ. Laconia, occasional (*Wests*).

C. ORNATUM Ralfs. Length 26–32 μ: breadth 27–34 μ: isthmus 8–10 μ. Pudding Pond, North Conway! Intervale! Squam Lake! Noone's Station!

C. Eloiseanum Wolle. Length 105 μ: breadth 72 μ: isthmus 34 μ. Laconia, scarce (*Wests*, H. J. no. 641)!

* Var. depressum W. & G. S. West. Length 92 μ: breadth without teeth 67 μ: with teeth 75 μ: isthmus 22 μ. A trifle larger than the measurements given by the authors. Pudding Pond, North Conway, frequent!

C. caelatum Ralfs, var.* **abnormale** var. nov. (Plate 64, figs. 6 and 7). Length 38–41 μ: breadth 37–38 isthmus 13–14 μ. The ends of the semi-cells are broadly truncate with five protuberances or lobes along the border each of these with two papillæ: at the side of each semicell is a large broadly rounded lobe as is usually seen in the typical species. Occasionally in the material there were specimens which showed the connection with the typical, but these were few and the variety on the other hand was abundant. North Woodstock (H. C. no. 187)!

C. Blyttii Wille. Length 12 μ: breadth 12 μ: isthmus 3 μ. Squam Lake!

C. impressulum Elfv. Length 25 μ: breadth 19 μ: isthmus 3.5 μ. Pudding Pond, North Conway!

C. pseudopectinoides Wolle. White Mountains (*Wolle*).

C. dispersum Johnson. Length 40 μ: breadth 40–44 μ: isthmus 11 μ: thickness 20 μ. Meredith (*Johnson*).

Pleurotaeniopsis Lund.

P. cucumis (Corda) Lund. (*Cosmarium cucumis* Wolle, '92). Length 59–72 μ: breadth 34–43 μ: isthmus 15–17 μ. Pudding Pond, North Conway, frequent! Saco Lake (*Wood*).

P. Debaryi (Arch.) Lund. (*Calocylindrus DeBaryi* Wolle '92). Length 75 μ: breadth 37 μ: isthmus 25 μ. Pudding Pond, North Conway!

* P. elegantissimum Lund. (*Cosmarium elegantissimum* Wolle '92), var. **simplicius** (W. & G. S. West) n. comb. Length 47 μ: breadth 22 μ: isthmus 19 . Intervale (H. C. no. 159)! The type of the variety was from Florida.

P. ovale (Ralfs) Lund. (*Cosmarium ovale* Wolle '92), var. * **Westii** var. nov. The form mentioned by the Wests ('96) p. 249 as a common American form. It has a slightly subtruncate and

retuse apex, with the retuse portion without granules. Length 154–170 μ: breadth 86–93 μ: isthmus 30–36 μ. Pudding Pond, North Conway, scarce!

XANTHIDIUM Ehrenb.

X. ARMATUM (Bréb.) Rab. North Woodstock!

Var. CERVICORNIS W. & G. S. West. Length with spines 166 μ: without spines 130 μ: breadth with spines 125 μ: without spines 90 μ: isthmus 31 μ. Pudding Pond, North Conway! Saco Lake (*Wood*). There was no central group of granules as is frequently found in this species.

X. CRISTATUM Bréb. Length with spines 75 μ: breadth with spines 50 μ: isthmus 14 μ. Pudding Pond, North Conway! Noone's Station!

Var. UNCINATUM Bréb. Length with spines 80 μ: without 59 μ: breadth with spines 56 μ: without 40 μ: isthmus 11 μ. Pudding Pond, North Conway!

* Forma ANGULATUM West. Length with spines 72 μ, without 54 μ: breadth with spines 60 μ: without 40 μ: isthmus 11 μ. No central protuberance present. Pudding Pond, North Conway!

X. ANTILOPAEUM (Bréb.) Kütz. Length with spines 105 μ, without 71 μ: breadth with spines 102 μ, without 59 μ: isthmus 16 μ. Pudding Pond, North Conway!

Var. POLYMAZUM Nordst. Length with spines 62–84 μ, without 46–68 μ: breadth with spines 58–63 μ, without 45–62 μ: isthmus 14–16 μ. Pudding Pond, North Conway, frequent! Intervale! North Woodstock!

There is a considerable amount of variation even in this variety. Specimens from North Conway and Intervale have the long outwardly curved spines, and there are almost invariably but six granules in the chain. A considerably different form was met with from North Woodstock. This is like the specimen figured by L. N. Johnson under the variety *Minneapoliense* with the exception of the central spine. His specimen had the central spine above the chain of granules. That form was called var. *Johnsoni* by W. & G. S. West in a later paper, although Johnson calls attention to the extreme variability of this form. The present form lacks the spine of *Minneapoliense* but has the median lateral spine as well marked as the two adjacent

ones. In this character the present specimen is exactly like that figured by Johnson. Nordstedt also figures this peculiarity in var. *polymazum* but it is in his specimens much less marked.

* Forma **curvispinum** forma nov. (Plate 64, fig. 11). Length with spines 93 μ: without 56 μ: breadth with spines 108 μ, without 50 μ: isthmus 13.5 μ. Membrane punctate: the spines at the end start straight then curve outward making a decided angle. Pudding Pond, North Conway, common!

* Forma **callosum** forma nov. (Plate 64, fig. 12). Length with spines 84 μ, without 58 μ: breadth with spines 74 μ, without 44 μ: thickness 25 μ: isthmus 13 μ. There is a thickened spot at the center of each semicell. Pudding Pond, North Conway, frequent!

X. Tylerianum West. (*X. antilopaeum*, var. *truncatum* Wolle). Rochester, (*Wolle, Hastings*).

X. controversum W. & G. S. West. Length with spines 55–59 μ, without 36.5–38 μ: breadth with spines 52–56 μ, without 31 μ: isthmus 7.6–8 μ: thickness 20–21 μ. Laconia (*Wests*).

* X. Bengalicum Turner. (Plate 64, fig. 10). Length with spines 90 μ, without 68 μ: breadth with spines 108 μ, without 62 μ: isthmus 22 μ: length of spines 20 μ. Near the upper end of each semicell is a row of 15–20 small granules. Squam Lake! New to U. S.

* X. tetracentrotum Wolle. (Plate 64, figs. 8 & 9.) Length 37 μ: breadth with spines 53–57 μ, without 32–34 μ: isthmus 9.5 μ. Intervale! Pudding Pond, North Conway! There is a great variation in the number and arrangement of the granules in this species. In the specimen from Intervale, fig. 9, there are indications of two distal spines one on each semicell.

Arthrodesmus Ehrenb.

A. convergens Ehrenb. Length 33–40 μ: breadth with spines 45–50 μ, without 34–35 μ: isthmus 8 μ. Intervale!

A. quadridens Wood. Length 35 μ: breadth with spines 50 μ: without 35 μ: isthmus 8 μ. Pudding Pond, North Conway!

A. Incus (Bréb.) Hass. var. * longispinus Eichl. & Racib. Length with spines 42 μ, without 14 μ: breadth with spines 38 μ, without 14 μ: isthmus 6.5 μ: length of spine 20 μ. Pudding Pond, North Conway!

* Var. validus W. & G. S. West. Length with spines 68–71 μ,

without 34–36 μ: breadth with spines 75–77 μ, without 36–43 μ: isthmus 7–8 μ: length of spine 25–27 μ. Spines shorter than the typical form. Pudding Pond, North Conway!

*Var. RALFSII W. & G. S. West. Length 25 μ: breadth with spines 59 μ, without 19 μ: isthmus 6.2 μ. Pudding Pond, North Conway (H. C. no. 164)! Squam Lake!

A. OCTOCORNIS Ehrenb. Length with spines 46 μ, without 14 μ: breadth with spines 44 μ, without 22 μ: isthmus 6 μ. Pudding Pond, North Conway!

* Forma MINOR Jacobs. Length with spines 21 μ, without 14 μ: breadth with spines 18 μ: isthmus 3 μ. Intervale! Var. new to U. S.

A. TRIANGULARIS Lagerh., var. INFLATUS W. & G. S. West. Length 38–40 μ: breadth with spines 68–72 μ: without 21–25 μ: isthmus 6.5–7 μ. Pudding Pond, North Conway, frequent! Laconia (*Wests*, H. J. no. 659).

STAURASTRUM Meyen.

S. ANCHORA W. & G. S. West. Length 76 μ: breadth 140 μ. Laconia, (*Wests*, H. J. no. 657).

S. ARACHNE Ralfs. Length 42 μ: breadth with processes 52 μ: isthmus 16 μ. Noone's Station! Saco Lake (*Wood*).

S. ARCTISCON (Ehrenb.) Lund. (*S. munitum* Wood.) Length with processes 150–155 μ, without 72–96 μ: breadth with spines 142–160 μ, without 62–68 μ: isthmus 31–33 μ. Wolle's figures of this species are not at all good. The figures of Wood are much more nearly correct. In their paper " On Some North American Desmidieae" (Trans. Linn. Soc. Lond. Ser. II. (Bot.) vol. v. pt. 5, p. 269) the Wests give the following: " All American examples we have seen of this species have shorter processes than the European ones, and they have at most but three rings of small teeth on each process." While this has been found true in Massachusetts specimens and some of those from New Hampshire it does not always hold true. The specimens from Pudding Pond, North Conway have long processes which are bifurcate at the apices as figured by Wood and have six or more rings of teeth on each process. Pudding Pond, North Conway! Squam Lake! Meredith, Holderness (*Wests*).

* S. ARCUATUM Nordst., forma ACICULIFERA W. &. G. S. West. Length with processes 26–27 μ, without 19 μ: breadth with proc-

esses 32–48.5 μ, isthmus 7.5–9.5 μ. Intervale! This variety is described simply as North American by the authors so that this record is the first with a definite locality. The specimens are in every way like the type of the variety except for slight variations in measurements.

* S. botrophilum Wolle. Length 46–50 μ: breadth 34–40 μ: isthmus 9.5–11 μ. North Woodstock, common!

S. Brasiliense Nordst. Length with spines 133 μ, without 75 μ: breadth with spines 120 μ, without 63 μ: isthmus 33 μ. Pudding Pond, North Conway! One specimen was noted which was five armed in end view.

S. Cerastes Lund. Length 56 μ: breadth with processes 46 μ: isthmus 11 μ. Pudding Pond, North Conway (H. C. no. 122)! This agrees in every way with the original figures of Lundell.

* S. claviferum W. & G. S. West. Length 36 μ: breadth with processes 42 μ, without 34 μ: isthmus 12 μ. Squam Lake! This again gives a definite locality for a species recorded simply as North American.

* S. concinnum W. & G. S. West. (*S. forficulatum* Wolle '92.) Length 45 μ: breadth 72 μ: isthmus 12 μ. Intervale!

* S. cornigerum Roy & Biss. Length 38 μ: breadth with spines 41 μ: isthmus 10 μ. Pudding Pond, North Conway (H. C. no. 151)! Intervale! New to U. S.

S. echinatum Bréb. Length 42 μ: breadth 34 μ. Pudding Pond, North Conway!

S. forficulatum Lund., var. enoplon West. (*S. crescentum* Hastings) Dover (*Wolle*).

S. gracile Ralfs. Breadth with processes 50–62 μ: isthmus 10.5 μ. Pudding Pond, North Conway!

S. grande Bulnh. Length 70 μ: breadth 65 μ: isthmus 15 μ. Intervale! Meredith (*Johnson*).

S. Johnsonii W. & G. S. West. Length 45–56 μ: breadth with processes 82–102 μ: breadth at base 14–18 μ: isthmus 8–9 μ. Intervale, common! Meredith, Holderness, Laconia (*Wests*).

S. Laconiense W. & G. S. West. Length 31 μ: breadth with spines 48–53 μ: without 38 μ: isthmus 12 μ. Pudding Pond, North Conway! Laconia (*Wests*).

S. leptacanthum Nordst. Length with processes 84 μ, without 34 μ: breadth with processes 65 μ, without 22 μ: isthmus 11 μ. Pud-

ding Pond, North Conway! This was the typical form, that called by Lagerheim 6 + 4 radiata.

S. LEPTOCLADUM Nordst. Length with processes 74–80 μ, without 30 μ: breadth with processes 96–112 μ: isthmus 11 μ. Pudding Pond, North Conway!

S. LEWISII Wood. Breadth with processes 62 μ: without 34 μ: isthmus 5.5–6 μ. Pudding Pond, North Conway (H. C. no. 136)! Saco Lake (*Wood*). This has the basal spines, the absence of which seems to be the only difference between it and *S. aristiferum* Ralfs. var. *parallelum* W. &. G. S. West.

* S. LONGIRADIATUM W. & G. S. West, forma MAJOR W. &. G. S. West. Length with processes 62–68 μ, without 31 μ: breadth with processes 80–90 μ, isthmus 10 μ. Pudding Pond, North Conway (H. C. no. 151)! This had more curved processes than the specimen figured by the authors but was in essential points the same. It had the three spines at the end of the processes which is characteristic of the form. This again gives a definite locality for a species described simply as North American.

* S. LONGISPINUM (Bail.) Arch., var. **bidentatum** (Wittr.) n. comb. (Plate 64, fig. 13.) (*S. bidentatum* Wittr.) Length 103 μ: breadth with spines 125–155 μ, without 90–92 μ: isthmus 33 μ: length of spine 29 μ. Squam Lake! Pudding Pond, North Conway, occasional! The form with two spines at each angle and these short and fairly stout instead of long as in the typical.

* S. LUNATUM Ralfs. Length with spines 40 μ, without 30 μ: breadth with spines 40–44 μ, without 28–32 μ: isthmus 6.5 μ. Pudding Pond, North Conway!

S. MACROCERUM Wolle. Length 58 μ: breadth with processes 125–127 μ: without 22–25 μ: isthmus 15 μ. Pudding Pond, North Conway, frequent!

S. MEGACANTHUM Lund. Length 46 μ: breadth with spines 83 μ. Pudding Pond, North Conway!

S. MEGALONOTUM Nordst. Length with spines 48 μ: breadth with spines 40 μ: isthmus 12.5 μ. Pudding Pond, North Conway (H. C. no. 131)!

Forma OBTUSUM Hast. Rochester (*Hastings*).

* S. MINUTISSIMUM Reinsch., var. CONSTRICTUM West. Length 24 μ: breadth 24 μ: isthmus 9 μ. Squam Lake!

S. MUTICUM Bréb. Length 36 μ: breadth 36 μ. Squam Lake!

S. Ophiura Lund., var. * tetracerum Wolle. Length 60 μ: breadth with processes 108 μ: without 24 μ: isthmus 15 μ. Pudding Pond, North Conway, frequent!

S. paradoxum Meyen. Breadth 45 μ. Squam Lake! Saco Lake (*Wood*).

S. pentacladum Wolle. Length 38 μ: breadth with processes 47–52 μ: without 13–25 μ: isthmus 8–16 μ. Intervale! Noone's Station!

* S. **pulcherrimum** sp. nov. (Plate 64, fig. 14). Length with spines 100 μ, without 80 μ: breadth with spines 78 μ, without 46 μ: isthmus 15.5 μ. In front view semicells compressed spherical, in end view quadrangular with the sides tumid, each angle with two large spines confluent at the base, sides with four vertical rows of paired granules arranged in fours. Pudding Pond, North Conway (H. C. no. 131)!

S. saltans Josh., var. forcipigerum Lagerh. (Plate 64, fig. 15.) Length without spines 65 μ: breadth with processes 118 μ: breadth at base 12.5 μ: isthmus 7 μ. Pudding Pond, North Conway, frequent!

S. spongiosum Bréb. Length with processes 65 μ, without 53 μ: breadth with processes 53 μ: isthmus 15 μ. Pudding Pond, North Conway (H. C. no. 129)!

* Var. depauperatum Racib. Length 41 μ: breadth 28 μ: isthmus 8 μ. Pudding Pond, North Conway (H. C. no. 129)!

S. striolatum Näg. Breadth 34 μ: isthmus 10 μ. North Woodstock!

Forma Brasiliense Turner. Length 25 μ: breadth 22 μ: isthmus 7 μ. Laconia (*Wests*, H. J. no. 676).

S. sublaevispinum Wests. Length 25 μ: breadth 37 μ: isthmus 7 μ. Laconia (*Wests*, H. J. no. 651)!

Sphaerozosma Corda.

S. excavatum Ralfs, forma laevis Rab. Length 12–12.5 μ: breadth of filament 12 μ: isthmus 4.5 μ. Pudding Pond, North Conway, frequent!

Forma granulata Rab. (*S. spinulosum* Wolle, ? '92). Length 9–10 μ: breadth of filament 9 μ: isthmus 3.2 μ. Pudding Pond, North Conway! Intervale!

ONYCHONEMA Wallich.

*O. NORDSTEDTIANA Turner. Length 12.5 μ: breadth 12.5 μ: isthmus 3.5 μ: thickness 6.4 μ. Filament twisted, from one face to the next face 24 cells, complete double turn 48 cells. Intervale!

O. LAEVE Nordst., var. MICRACANTHUM Nordst. Length 14 μ: breadth with processes 21 μ, without 16 μ: isthmus 3.5 μ. Intervale!

SPONDYLOSIUM Bréb.

S. PULCHRUM (Bail.) Arch., var. INFLATUM (Wolle) W. & G. S. West. (*Sphaerozosma pulchrum*, var. *inflatum* Wolle '92). Length 33 μ: breadth of filament 65 μ: isthmus 10 μ. Pudding Pond, North Conway (H. C. no. 138)! Laconia (*Wests*, H. J. no. 667)!

S. MONILIFORME Lund. (*Sphaerozosma moniliforme* Wolle '92). Length 34 μ: breadth 17 μ. Laconia (*Wests*, H. J. no. 680)!

HYALOTHECA Ehrenb.

H. DISSILIENS (Smith) Bréb. Length 22 μ: breadth of filament 25–28 μ. Pudding Pond, North Conway! North Woodstock!

*Var. MINOR Delp. Length 12–15 μ: breadth of filament 18–22 μ. Intervale!

DESMIDIUM Ag.

D. APTOGONUM Bréb. Length 12 μ: breadth of filament 21–34 μ: isthmus 14 μ. Pudding Pond, North Conway, frequent! Intervale!

D. BAILEYI (Ralfs) Nordst. Length 20–25 μ: breadth of filament 21–25 μ. Pudding Pond, North Conway! Intervale!

D. SWARTZII Ag. Length 12 μ: breadth of filament 37–43 μ. Pudding Pond, North Conway! Intervale!

* D. COARCTATUM Nordst. Length 28–40 μ: breadth of filament, maximum 38–45 μ, minimum 25–33 μ. Pudding Pond, North Conway, common!

D. QUADRATUM Nordst. Length 22 μ: breadth of filament 36–40 μ. Intervale! Noone's Station!

D. GRACILICEPS (Nordst.) Lagerh. Pudding Pond, North Conway!

D. CYLINDRICUM Grev. Maximum breadth 46 μ, minimum 31 μ. Pudding Pond, North Conway!

GYMNOZYGA Ehrenb.

G. MONILIFORMIS Ehrenb. (*Bambusina Brebissonii* Wolle '92). Length 25–37 μ: maximum breadth 18–25 μ, minimum 16–21 μ. Pudding Pond, North Conway! Intervale!

Altogether in the two parts of the present paper there are reported two hundred and fifty-three species and varieties of Desmids. Hitherto there were but seventy-four reported from the State, so that one hundred and seventy-nine are new records for the State. A considerable number of the species or varieties were also new to the New England list. One thing is very noticeable and that is the confirmation of the fact that a granitic country or one with old geological rocks will give a much greater number of species than one of opposite character. In the collection from Pudding Pond, North Conway, in spite of the fact that but one collection was made at only one time of year there have been identified one hundred and twenty-six species and varieties, exactly one half of the whole number reported from all sources from the State. This number might be increased by a continued examination of the Pond at other seasons and at other parts. Altogether from the small amount of ground covered there is every indication that the State of New Hampshire will furnish a large part of the Desmids that will be reported from New England.

BOSTON SOCIETY OF NATURAL HISTORY.

EXPLANATION OF PLATE 64.

Figures 4, 10–13, × 400: all others × 550.

Figure 1. ***Euastrum crassum*** (Bréb.) Kütz., var. ***pulchrum*** var. nov.
" 2. ***Euastrum fissum*** W. & G. S. West, var. ***Americanum*** var. nov.
" 3. ***Cosmarium claviferum*** sp. nov.
" 4. ***Cosmarium obliquum*** Nordst., var. ***trigonum*** West.
" 5. ***Cosmarium grandiforme*** Schmidle, var. ***Americanum*** var. nov.
" 6, 7. ***Cosmarium caelatum*** Ralfs, var. ***abnormale*** var. nov. Fig. 7 shows connection with the typical form of the species.
" 8, 9. ***Xanthidium tetracentrotum*** Wolle.
" 10. ***Xanthidium Bengalicum*** Turner.
" 11. ***Xanthidium antilopaeum*** (Bréb.) Kütz., forma ***curvispinum*** forma nov.
" 12. ***Xanthidium antilopaeum*** (Bréb.) Kütz., forma ***callosum*** forma nov.
" 13. ***Staurastrum longispinum*** (Bail.) Arch., var. ***bidentatum*** (Wittr.).
" 14. ***Staurastrum pulcherrimum*** sp. nov.
" 15. ***Staurastrum saltans*** Josh., var. ***forcipigerum*** Lagerh.

Draba borealis in Eastern America. — In the discussion of the plants which in eastern America have passed as *Draba incana* Mr. Knowlton and I referred[1] briefly to a species of the Behring Sea region, *D. borealis* DC., which has been known only from northwestern America and adjacent Asia. While exploring the bleak exposed shores of Cap Enragé, outside the harbor of Bic on the lower St. Lawrence, Mr. J. F. Collins and I were greatly pleased, therefore, to find in July last very characteristic specimens of this Alaskan species. The plants, large and finely developed, were growing in the shade of boulders at the base of the precipitous sea-wall, but they had been so freely nibbled by the nesting gulls that it was impossible to secure much perfect material. Such plants as were collected are beautifully matched by specimens from Unalaska, Behring Island, and shores of the Ochotsk Sea.

Draba borealis is very quickly distinguished from the local *D. megasperma*, to which it is nearest related, by its larger more numerous leaves, very loose elongate pubescence, and by the longer-pedicelled siliques which are oblong-lanceolate, strongly twisted, and, including the prominent styles (1 mm. or more long), in maturity becoming 1.5 to 1.8 cm. long. — M. L. Fernald, Gray Herbarium.

The Fern Allies.[2] — Mr. Clute's recently issued work on the fern allies is similar in character to his "Our Ferns in their Haunts." By devoting a whole volume to a restricted group of plants the author has been able to give considerable space to each species and thus state at length and in popular language facts concerning the habits and habitats, which have ordinarily been compressed into a few terse and technical expressions. It is well known that species and varieties in the fern allies are somewhat vague in their natural limitation and consequently subject to widely different interpretation. The author has wisely refrained from excessive splitting and has evidently endeavored to make his nomenclature conservative. He has not, however, been able to refrain from framing a few new and, at least in some cases, quite needless combinations, as for instance

[1] Rhodora, vii. 65.

[2] The Fern Allies of North America North of Mexico by Willard Nelson Clute, with illustrations by Ida Martin Clute; 8vo, xiv, and 278 pp.; F. A. Stokes Co., New York.

his *Lycopodium Selago lucidulum*, a name which will scarcely be maintained by any careful observer or trained systematist and which even the author himself discards before he reaches his checklist of species at the end of the volume. The littering of botanical synonymy with such useless names seems to us more reprehensible than any bone fide attempt no matter how radical to reform nomenclature. It may be properly urged furthermore that the launching of new names or combinations should not be attempted unless their exact relation to earlier names is made clear by adequate and orderly bibliographical references to previous literature. If it should be held that such definite and scholarly citation is out of place in a manual primarily intended for beginners, it is no less clear that such popular works are not the medium for the publication of new scientific names. In the checklist the name *Robbinsii* is spelled *Robinsii*, and *porophilum* is spelled *porophylum*. A brief glossary is appended in which some of the definitions such as "Tomentose. — Covered with matted wool," "Panicle. — A cluster of fruit in which the stems branch more or less," and "Spatulate. — Spoon-shaped," might have been considerably improved.

The pen illustrations which are numerous and sufficiently characteristic will doubtless be useful to the beginner. Some colored process plates are less successful, exhibiting in distorted perspective certain species, which stand out in front of their scenic background in a way strongly suggestive of their majestic allies of the carboniferous period.

Notwithstanding some defects the book is a worthy addition to popular botanical literature and will doubtless aid many in the study of an interesting group of plants. — B. L. R.

The Tenth Anniversary of the Founding of the New England Botanical Club. — On December 1st, the New England Botanical Club held its annual meeting at Hotel Brunswick, in Boston. At the business session the customary reports of the treasurer and curators were presented, several new members were voted into the Club, and the following officers were elected for the coming year: *President*, B. L. Robinson, *Vice-President*, Walter Deane, *Recording Secretary and Treasurer*, E. F. Williams, *Corresponding Secretary*, E. L. Rand, *Phanerogamic Curator*, M. L. Fernald, *Cryptogamic Curator*, Hollis Webster, *Councillors*, Messrs. G. G. Kennedy, F. S. Collins, and F. D. Lambert.

The business session was followed by a dinner in celebration of the tenth anniversary of the founding of the Club. The retiring president, Mr. F. S. Collins, presided and acted as toast master. Mr. Williams, who for the whole ten years has served as the recording secretary and treasurer of the Club, gave an admirable sketch of its history, specially emphasizing the value of such an organization in stimulating and co-ordinating the activities of the amateur botanists of the region. On motion of Mr. Rand, it was unanimously voted that this historical sketch should be printed for distribution to all members of the Club. The other speakers were Messrs. Farlow, the first president of the Club, Robinson, Fernald, Webster, Deane, and Brainerd, whose addresses felicitously recalled many of the more humorous as well as the serious aspects of the work in which the Club has been engaged during the past decade. The dinner was attended by nearly fifty resident and non-resident members, who had gathered from New York, New Brunswick, and every state of New England except New Hampshire. The evening will long be remembered as one of the pleasantest in history of the Club.

The Death of Francis Howard Peabody. — It is with deep regret that we record the death on September 22nd, 1905, of Francis Howard Peabody. As senior member of one of the most prominent and successful banking firms in New England, Mr. Peabody was subject to the constant and pressing demands of his influential position. It is, therefore, one of the best evidences of his breadth of interests and largeness of character that he found time and attention for literary and scientific pursuits. As a pupil and for many years thereafter a warm personal friend of Dr. Asa Gray, Mr. Peabody had a very cordial interest in botanical investigation, and for several years served as chairman of the Visiting Committee of the Gray Herbarium. He became a member of the New England Botanical Club June 4th, 1897, and gave much cordial encouragement as well as financial aid to its various undertakings. Although he would have been the last to claim much technical knowledge of botany, his well trained judgment and keen discrimination gave him a surprising insight into the ideals and problems of modern botanical research. Mr. Peabody died suddenly of heart-disease at his summer home in Beverley, Massachusetts. He was in his seventy-fourth year.

ERRATA.

Page 7,	line 53;	for	blue *read* violet.
" 36,	" 29;	"	*Michx.* read Michx.
" 60,	" 23;	"	persistentem *read* persistens.
" 60,	" 31;	"	Vermont *read* VERMONT.
" 67,	headline;	"	Darba *read* Draba.
" 113,	line 10;	"	*Calocylindricus* read *Calocylindrus.*
" 114,	" 11;	"	*Calocylindus* read *Calocylindrus.*
" 117,	" 31;	"	GRANULATA read GRANULATUM.
" 123,	" 32;	"	pepperedge *read* pepperidge.
" 142,	" 30;	"	tenerifolia *read* tenuifolia.
" 142,	" 30;	"	Enonymus *read* Euonymus.
" 145,	" 23;	"	Jersey *read* York.
" 148,	" 7;	"	*Sornborger* read Sornborger.
" 154,	" 26;	"	*Stygius* read *stygius.*
" 154,	" 27;	"	*Pingincula* read *Pinguicula.*
" 159,	" 20;	"	MUNROA read MUNRÒA.
" 159,	" 21;	"	LISTERA read LÍSTERA.
" 159,	" 38;	"	ERIGENIA read ERIGENÌA.
" 160,	" 7;	"	STENOSIPHON read STENOSÌPHON.
" 160,	" 19;	"	LILIUM read LÌLIUM.
" 160,	" 23;	"	MODIOLA read MODÍOLA.
" 160,	" 27;	"	CHAMAELIRIUM read CHAMAELÌRIUM.
" 161,	" 6;	"	SENECIO read SENÉCIO.
" 161,	" 18;	"	PRIMULA read PRÌMULA.
" 161,	" 19;	"	VACCINIUM read VACCÌNIUM.
" 167,	" 2;	"	*racemosa* read *racemosus.*
" 186,	" 15;	"	auguste *read* anguste.

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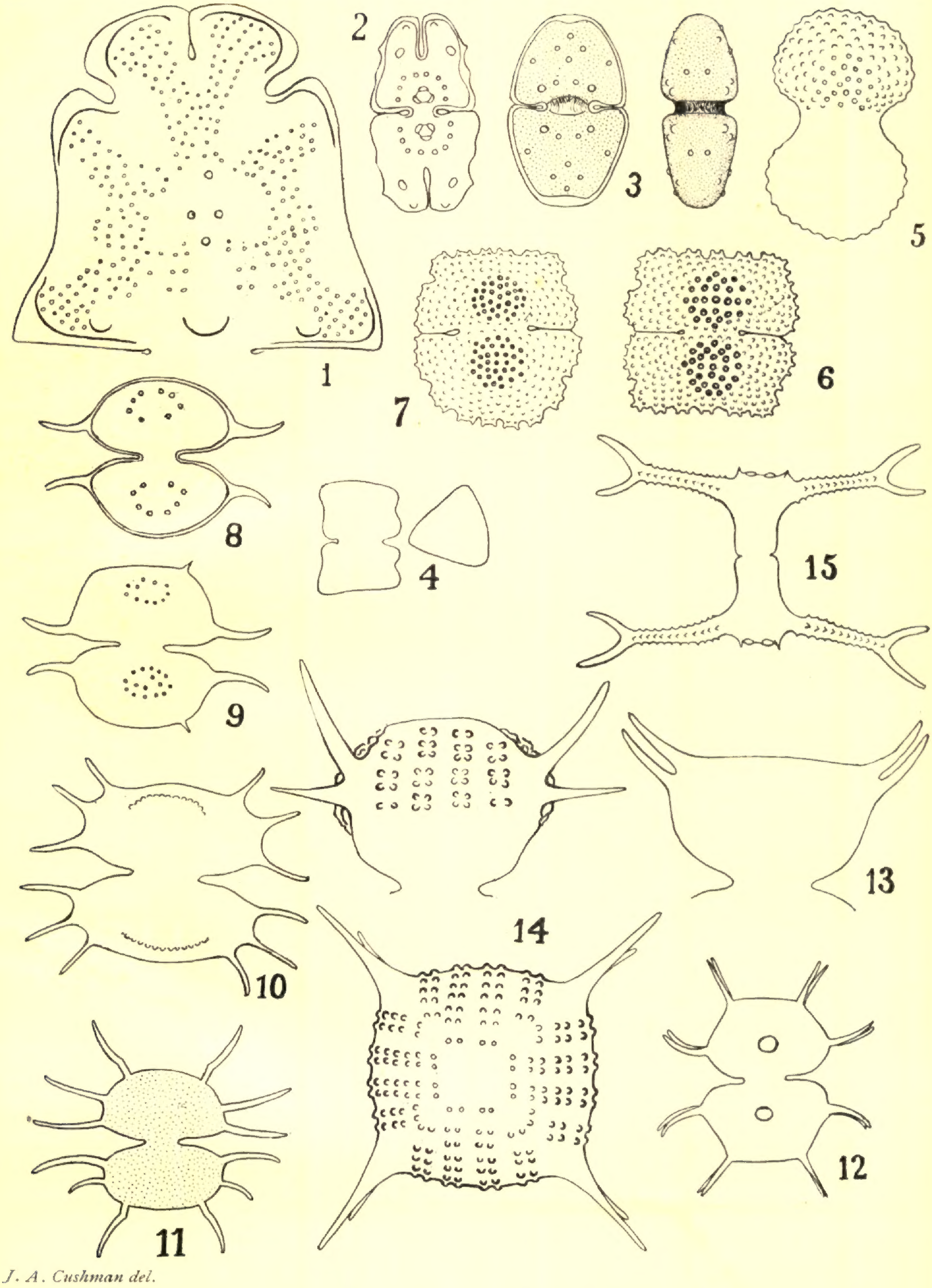

J. A. Cushman del.

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